

ANNALS of the Association of American Geographers

Volume XLIII

JUNE, 1953

Number 2

A CASE FOR POPULATION GEOGRAPHY*

GLENN T. TREWARTHA

University of Wisconsin

INTRODUCTION

MY thesis for your consideration may be very simply stated: the geography of population has been, and continues to be neglected, to the injury of geography in general, and a serious and sustained effort should be made to develop a working concept of population geography which may be applied broadly in teaching and research.

As I enter upon an elaboration of the above proposition I am very conscious of a pungent German proverb: "Weiss man nichts, so schreibt man über Methode," a proverb which I have adopted as something of a personal warning and guide. I am a conscientious objector as far as much methodological discussion and writing are concerned, and have long insisted that doing substantive work is far more important than talking or writing about how it should be done. Moreover my conviction is strong that methodological writing which is the outgrowth of ample experience in doing substantive research rests upon a more secure foundation than that which is developed by deductive philosophical reasoning. It follows, therefore, that those best qualified to engage in fruitful methodological discussion are the workers whose ideas have been tested in the fires of performance.

If the above reasoning is correct I would be the first to admit that my professional experiences and accomplishments do not qualify me to write as an expert concerning the position of population geography and of its organization, content, and subdivisions. But at the risk of being considered hoist on my own petard I venture to explore this field. I am somewhat emboldened by what appears to be the urgency of the case, and also by the paucity of professed specialists in population geography who might bring to the discussion a superior wisdom derived from experience. The conviction that the neglect of population geography constitutes a fundamental weakness in the general approach to modern geography urges me to delay no longer a preliminary statement of the case for the population element.

* Presidential address delivered before the Association on the occasion of its 49th annual meeting held in Cleveland, Ohio, Mar. 30-Apr. 2, 1953.

Fitzgerald in a recent paper has stated that, "The chief difficulty in attaining a regional classification acceptable to the strictest canons of geographical methods, results from some remaining uncertainty as to the place of man within the frontiers of geography."¹ Here is a challenge and one that requires immediate acceptance. It is possible that the uncertainty referred to has been a discouraging factor and that clarification relative to the structure and facets of population geography, and to just where population fits and has a place within the geographical system, may have the effect of activating this field in research and teaching.

POPULATION A SLIGHTED ASPECT OF GEOGRAPHY

Judged by any one of several criteria I am obliged to conclude that geographers, and especially American geographers, have not made population one of their major concerns. In the way that climate, landforms, agricultural land use, and manufacturing, for example, have been made the subjects of special systematic treatment in geographic research and teaching, or that these same topics have been important and integral parts of holistic regional studies, population by comparison has been neglected.

Slight Recognition in Treatises on Content and Methodology of Geography

A scrutiny of a number of the standard works on the nature, content, and methods of geography reveals a complete omission of any reference to population geography by most writers. Of those analyzed, in only one is there an elaboration of the topic to the point where the reader is impressed by the author's recognition of its importance and of his awareness of where it fits into the geographical structure.

In the three-volume work of Siegfried Passarge, *Grundlagen der Landschaftskunde*, one of the most detailed analyses of geographical structure and content, there is a section entitled, "Der Mensch und seine Werke." The title is inappropriate, however, for the entire content is an analysis of the works of man, including house types, settlement forms, communications, and the different economies, but man himself, as population, is completely ignored. That this was not just an oversight in this earlier publication, dated 1920, is suggested by the continued omission of any reference to population in *Vergleichende Landschaftskunde* (1921-1930), *Beschreibende Landschaftskunde* (1929), and *Einführung in die Landschaftskunde* (1933), all published at later dates.

In *The Nature of Geography* by Hartshorne² various branches of the field such as physical geography, historical geography, political geography, and economic geography are singled out for special treatment, but no reference is made to population geography as a systematic subdivision. In the index to this volume it is indicated that the topic of population is referred to three times in the text, but the references are completely incidental and no comment on content or method is intended.

¹ W. Fitzgerald, "Progress in Geographical Method," *Nature*, CLIII (April 1944): 481.

² Richard Hartshorne, *The Nature of Geography*.

Dickinson and Howarth in their volume, *The Making of Geography*,³ discuss the evolution of human geography, but make no mention of the place of population within this field. Economic, political, social, and historical geography are all analyzed, but population is omitted. Their index does not so much as contain the word population. Wooldridge and East's *The Spirit and Purpose of Geography*,⁴ a more recent British contribution in the field of geographic content, is equally neglectful of any recognition of the population element.

Hettner in *Die Geographie; ihre Geschichte, ihr Wesen und ihre Methoden*,⁵ by contrast with the others mentioned, does clearly single out population as a prime element for geographical study. Unfortunately this volume contains no index so that it is difficult to trace all references to the topic. In his treatment of the eight branches of geography, however, "Die Geographie des Menschen" is recognized as a major field and population geography, or *Bevölkerungsgeographie*, is cataloged as a principal subdivision of the larger field of human geography. Hettner proceeds to elevate population geography to an important position because, as he says, population has a great influence on all of the other geographic elements. He argues that *Bevölkerungsgeographie* and *Bevölkerungsstatistik* are essentially different, for geography limits itself to those aspects of population which are closely related to the nature of the land, and includes features in addition to density and movements. It goes beyond *Bevölkerungsstatistik* in that it analyzes population characteristics of areas for which there are few or no population statistics. But although Hettner specifically recognizes the field of population geography, he makes no serious attempt to analyze its content or methods.

A sampling of some of the better-known shorter pronouncements on geographic content and method reveals a considerable range of emphasis relative to the population element, but with outright neglect or casual reference being the most common forms of treatment. Camille Vallaux in his essay on Human Geography contained in the *Encyclopedia of the Social Sciences* avoids any mention of population. Carl Sauer in his chapter on Cultural Geography in the same source emphasizes material culture as the geographer's focus of attention and adds the positive statement that man himself is "... not directly the object of geographic investigation. . . ." In two other of his essays, however, "The Morphology of Landscape"⁶ and "Recent Developments in Cultural Geography"⁷ population density and mobility are included in diagrammatic representations of the forms of the cultural landscape. Significantly though, in Sauer's treatment of the content of the several branches of geography, no mention is made of a special field of population geog-

³ Robert E. Dickinson and O. J. R. Howarth, *The Making of Geography*.

⁴ S. W. Wooldridge and W. G. East, *The Spirit and Purpose of Geography*.

⁵ Alfred Hettner, *Die Geographie; ihre Geschichte, ihr Wesen und ihre Methode*.

⁶ Carl O. Sauer, "The Morphology of Landscape," *University of California Publications in Geography*, 2, 1925.

⁷ Carl O. Sauer, "Recent Developments in Cultural Geography," Chapter 4 in *Recent Developments in the Social Sciences*, Edward Cary Hayes, ed.

raphy. Barrows in his essay, "Geography as Human Ecology,"⁸ makes no specific reference to population. One of the most positive statements concerning population geography, its subdivisions and its position within the general field, is included in Sten de Geer's paper entitled, "On the Definition, Method and Classification of Geography."⁹ In his essay he refers to the geography of population as a distinctive branch of the general field and presents an outline of its contents and subdivisions.

General Treatment of Population in Treatises on Human Geography

Further evidence concerning the evaluation of the population element is furnished by a glance at some of the substantive treatises on human geography.

Vidal de la Blache in his *Principles of Human Geography* clearly recognizes population as forming a primary element of the extensive field on which he is writing, for he devotes all of Part I, or about one-third of his volume, to the topic, distribution of population. The entire emphasis is on distribution of numbers and associated density patterns. There is no recognition of other geographical aspects of population; no attempt is made to arrange and classify its content, and I can detect no disposition to recognize population geography as a distinct and primary subdivision of the broader field of human geography.

Jean Bruhnes in his volume, *Human Geography*, restricts the content of that field to the visible evidences of man's occupation and use of the physical environment. The essential facts of human geography are the marks left by man upon the earth's surface. Bruhnes does, however, introduce order and classification into the treatment of the facts or elements of human geography, and of first rank among these facts he places the unequal covering of the earth's surface with people. Their numbers, not their qualities, are emphasized. The primary maps, according to Bruhnes, are those of water and men. But, he asks, "How does population reveal itself?" He answers that men are approached and measured through the habitation, for there they are caught and counted. The earth's covering of human dwellings accordingly is a phenomenon more geographical than the earth's covering of human beings. The one is the first visible sign of the second. "Truly geographical demography is above all the demography of the habitation," says Bruhnes. To that statement I feel obliged to dissent. One can readily agree that it is in connection with the size and spacing of settlement units that the ultimate details of population distribution are to be observed and mapped. But Bruhnes' subsequent discussion is not concerned with the size and spacing of population units as revealed by settlements, but rather with the morphology of houses and settlements. Unless one is to assume that degree of visual conspicuousness is the best measure of geographical importance there is no reason to substitute houses for people. One does not substitute barns for cattle, nor the factory structure for the

⁸ Harlan H. Barrows, "Geography as Human Ecology," *Annals of the Association of American Geographers*, XIII (1924): 17-33.

⁹ *Geografiska Annaler* (1923): 1-37.

goods produced. What is more, there are effective ways of studying some phenomena other than by first-hand personal observation. So, although Bruhnes specifically recognizes the geographical importance of the population element, he proposes to study it obliquely through the channel of habitation and settlement morphology and as a consequence makes little contribution to population geography as such. One searches in vain for an outline of content.

An analysis of Alfred Hettner's *Allgemeine Geographie des Menschen* leaves no doubt that this author viewed the study of population as an integral and important part of the general field of human geography. In his analysis of the separate branches of human geography he singles out *Bevölkerung* (population) and gives it equal prominence with such topics as settlements and dwellings, trade and transportation, the economies, and the State. Although his treatment of each of these separate branches of human geography is consistently brief, he gives unmistakable evidence of the high relative position which he accords to population, pointing out that men operate in the dual capacity of both producers and consumers, or as Hettner puts it, population may be thought of in one way as hands and in another way as mouths. Momentary numbers and densities, while important, are not sufficient; population must be treated dynamically according to Hettner, and hence involve the concepts of regional birth rates, death rates, immigration, and out-migration. Nor should the geographer's analysis be confined to biological phenomena only, for social qualities, dependent upon prevailing economic, political, and social-psychological conditions, are equally, if not more, important. Geography is obliged to consider, on the one hand, the comparative dependence of population on natural, economic, and social conditions, and, on the other hand, to describe and explain the contrasts in population numbers and densities in different parts of the earth. Thereby is laid the groundwork for answering the all-important question relative to the capacity of the earth and its individual regions to support population. Brief though Hettner's remarks on population geography are, still they are among the most direct and illuminating ones to be found on the topic. One could wish that this master had seen fit further to elaborate his ideas on the subject.

In *Handbuch der Geographischen Wissenschaft*,¹⁰ Hassinger's comprehensive treatment of *Die Geographie des Menschen* does not appear to recognize population geography as a distinct branch of the subject as does Hettner. To be sure he proclaims that the dynamic element, man, is not of less importance in the cultural landscape than man's works, but his analysis of man, or population, is disappointingly anthropological.

Huntington and Shaw in their *Principles of Human Geography*,¹¹ omit entirely any direct reference to, or organized treatment of, population. The book's index contains only two textual references to population and these are quite incidental.

¹⁰ *Allgemeine Geographie, Zweiter Teil, Das Leben auf Der Erde.*

¹¹ Ellsworth Huntington and Earl B. Shaw, *Principles of Human Geography*, 6th edition.

The Geography of Population as Such

The single comprehensive treatment by a geographer of the facts of population geography, of which I am aware, is contained in a recent book by Pierre George of France which bears the title, *Introduction à l'étude géographique de la population du monde*.¹² Here for the first time I believe has there been an attempt to present in book form and size a geographic study of the earth's population. Whether one agrees with the content, organization, and Marxian slant as developed by George seems to me less important than recognizing that here is a pioneer study and hence one of signal importance. The way is now open for others to improve upon this first attempt.

Other Sources of Evidence Suggesting the Inferior Position of Population Geography

Additional evidence concerning the position accorded to population in geographical science may be obtained from noting such items as: 1) the number and quality of publications on population by geographers; 2) the attention given to the population element in holistic regional studies; 3) the number of doctoral dissertations in geography focusing on population themes; and 4) the amount and quality of professional training in population as indicated by the courses offered in the geography curricula of universities.

In a survey made of the publications of American geographers on the substantive aspects of population since 1925, a total of 45 titles were counted for a period which was approximately a quarter century.¹³ As far as mere number of contributions is concerned this may not appear to suggest an unusual neglect of the field. However, a closer examination of these contributions indicates that by far the greater share of them were undertaken by investigators who were essentially amateurs. Most of the authors were one-paper contributors who did not continue to publish in the field of population. In a large number of cases they appear to have been young professionals who were primarily interested in other fields and who lacked the competence which previous experience or adequate training might provide. Their interest evidently waned after the production of a single paper. There were notably few repeaters. A number of the papers appear to have been inspired by the fact that a new decennial census had recently been published, suggesting a certain opportunistic attitude rather than one of developed and sustained interest. With due recognition of those in our profession who have authored meritorious studies on population, it still may fairly be said, I think, that the American literature on population geography is a diluted and watered one, with more shortcomings in quality than in mere quantity.

¹² Along this line see also: Louis Chevalier, "Demographie et geographie," *Annales de geographie*, LVI (July-Sept., 1947). Chapter 28, "Population," in *Elements of Geography* by Vernor C. Finch and Glenn T. Trewartha represents a brief outline of the content of population geography.

¹³ *Preliminary Report of the Committee on Rural and Urban Settlement Geography*, National Research Council, July 1, 1951.

To supplement the survey made of American geographical literature, a hasty and entirely quantitative sampling was made of the contributions on population in certain European sources. Three standard geographical magazines were surveyed, viz., *Petermann's Geographische Mitteilungen*, *Annales de Géographie*, and *The Geographical Journal*. No attempt was made to judge the qualities of the contributions or the competence of the authors. The only result of the survey, therefore, relates purely to the number of titles which give evidence of dealing explicitly with population themes. All three of the foreign geographical periodicals reveal a scanty treatment of population topics. For example, a survey of *Petermann's Geographische Mitteilungen* over a recent four-decade period brought to light only three papers whose content was clearly in the field of population geography. In *The Geographical Journal* for the period 1910-1950 a total of 16 such papers were published and in the *Annales de Géographie*, 22.

A recent bibliography by Hans Dorries bearing the title, "Siedlungs und Bevölkerungsgeographie (1908-38)," ¹⁴ the only one of its kind of which I am aware, offers still another means for judging the relative position of population geography. Although the title suggests that the author considers settlement geography and population geography to be separate and coequal branches, an analysis of the bibliography's outline proves otherwise. In the introductory section, which covers the systematic aspects of the two fields, population is considered only under the sub-head, "Struktur der Siedlungslandschaft." This plan of organization indicates the subsidiary position in which the author places population geography in that it is made a branch of settlement geography. Moreover, out of the total 51 pages devoted to the listing of systematic titles, only 15 pages are devoted exclusively to population. The main body of the bibliography follows a regional organization and here again population is only one topical subdivision of each of the regional settlement landscapes. For example, under "British Settlement Landscapes" there are five subdivisions of which population is one. Two hundred ten titles are listed for various aspects of British settlement geography as compared with only 37 for population. A scanning of the titles listed under the heading of population indicates that a large proportion were authored by non-geographers and appeared in non-geographical publications.*

A much more difficult task than evaluating the place of population geography as such in the writings of geographers is to discover the prominence given to population as one element in holistic regional studies. The writer makes no pretense of having engaged in a comprehensive and careful inventory of large numbers of such studies, but only a rough sampling. For what such a sampling is worth, the conclusion reached from this type of analysis indicates that the population element is commonly slighted in the holistic regional studies of American geographers. In not a few regional analyses population is never mentioned directly

¹⁴ *Geographisches Jahrbuch*, Band 55, 1, pp. 1-380.

* Some of the most noteworthy contributions to the field of population geography have come from sociologists and demographers and have appeared in the professional publications of those disciplines.

and one is obliged to infer the existence of people within the region being studied entirely by indirect evidence. Emphasis usually is upon men's creations—houses, settlements, fields, communications—but the originator and creator of the whole cultural scene, the dynamic element, is either omitted or slighted. The evidence shows that this neglect of the population element is less characteristic of the published regional studies of European geographers.

Further testimony bearing upon the deemphasis of population is furnished by a survey of doctoral theses in geography. Out of a total of 343 such dissertations completed at American universities to June 1946 only 11, or slightly over three per cent, were on population subjects. More significant, perhaps, is the fact that few of the authors of these eleven dissertations continued to publish on population, so that the research associated with the thesis topic appears not to have awakened a continuing enthusiasm for investigations along this line. Significant also is the fact that these eleven dissertations were undertaken at schools where little or no professional training in the field of population geography was offered and where no person on the geography staffs had a serious professional interest in population.

Neglect of the field is most clearly revealed perhaps by the training programs of the Departments of Geography in American universities as exhibited by their course offerings. An inventory of the programs in over 20 of the largest or most distinguished departments revealed that in not one of them is there a separate content course dealing exclusively with population. One department does list a course labeled "Settlement Patterns" in which, from the brief catalog description, one would judge some attention is given to the general topic of population. Two other departments listed graduate seminars on population. This indeed reveals a serious lack of training opportunities in the field of population geography. In view of the above fact, one cannot help but wonder why there should have been even as many as 11 doctoral dissertations in geography focusing on population topics, and whether the 45 substantive papers in the field of population geography over the past quarter century may not have been too many.

Written and oral inquiries made of foreign geographers, especially British, French, and German, reveal a similar neglect of population geography as a systematic field in European universities. Hassinger and Bobek of Austria; Waibel, Bartz, Müller-Wille, and Otremba of Germany; Sorre of France; and East and Darby of Britain were all interviewed personally on this topic or they have replied to letters of inquiry. Without exception their testimony witnesses to the fact that population geography is not a specialized branch of university geography in their countries and that lecture courses in this field are not offered in their geography institutions. Opinion is more divided relative to whether there is a similar neglect of the population element in holistic regional studies.

From the various kinds of evidence presented I am obliged to conclude that both at home and abroad population geography as a systematic branch is not given the attention and emphasis which its importance warrants. It is omitted or slighted in treatises on geographic content and method. Geography curricula

almost without exception ignore it. Research in the field is relatively meager, and in general regional studies the population element, more often than not, is treated indifferently and without professional expertness.

WHY HAS POPULATION GEOGRAPHY BEEN NEGLECTED?

If it may be assumed that the evidence presented has revealed a neglect of population geography, it may be in order to inquire why this is the case. To be sure it has not been a consistent neglect, for the systematic treatment of population geography as a distinct and recognized branch of the parent field has received far less attention than might be assumed from merely counting the number of references to population in textbooks of geography or even enumerating the titles to papers focusing on population which have been published in geographical periodicals. Population numbers and distribution are items which appear rather frequently, but often incidentally, in geographical writings, and noteworthy papers have been produced. But isolated good papers and incidental treatment are not what I am discussing, however.† The question may fairly be asked relative to why there has been such a casual treatment of population as an element of geography and particularly why this element has not been singled out for a specialized topical development following the patterns set by agricultural geography, political geography, and industrial geography. I have no definitive answer to the question posed, but I propose to present a number of suggestions which have developed in my mind, some of which stem from conversations with professional colleagues.

In part the neglect may derive from the nature of one of the primary organizational divisions of our science which has long been recognized and almost universally accepted. I refer not to that division into regional (special) and topical (general), for I can see no valid reason why such an organizational plan should lead to a neglect of population. Certainly no adequate holistic study of an inhabited area may logically omit giving prime consideration to the population element. And since, as I hope to show later, population geography is the pivotal topical study within our field, either as applied to the earth as a whole or to most of its parts, there appears to be no good reason why it should have been neglected to an even greater extent in tropical or systematic geography.

It is that other organizational division of geography, the one which splits the field into physical and cultural, giving rise to the familiar breakdown into physical landscape and cultural landscape, which should share more of the blame. I have no quarrel with such a grouping of the geographic elements as a pedagogical device, but I do assert that the effect of the physical-cultural division in creating in the minds of many the rigid concept of two separate kinds of geography is fundamentally bad. Geography is a unitary science. Its single focus is its concern with the areas which comprise the earth's surface and no convenient organizational

† As a recent sample of a geographic population study of monographic size see, Pierre Gourou, *La Densité de la Population au Ruanda-Urundi*, Institut Royal Colonial Belge, Mémoires—Collection in -8°. Tome XXI, fasc. 6, 1953.

subdivision should be permitted to destroy this basic unity. I do believe, however, that a rigidity of thinking on the part of geographers which has caused them to classify all earth phenomena as either physical or cultural, results in the human animal, which fits logically into neither category, being considered something of an outsider and a misfit.

The ancestors of man at the precultural level may be considered a part of the natural earth. It was only when these ancestors became men and developed culture that the differentiation into a physical landscape and a cultural landscape became possible. Since culture originates with human beings, civilized man can scarcely be grouped with other living things within that branch of physical geography designated as biogeography. Yet the originator and creator of the cultural earth has appeared logically to be excluded from cultural geography as well. The creator can scarcely be classified as an element of his own creation. He stands outside and beyond culture. Sauer makes this position clear when in an essay on cultural geography previously referred to he writes, ". . . but because man, *himself not directly the object of geographic investigation*,¹⁵ has given physical expression to the area by habitations, workshops, markets, fields, lines of communications. Cultural geography is therefore concerned with those works of man that are inscribed into the earth's surface and give to it characteristic expression."¹⁶

Following a similar line of reasoning, Jean Bruhnes, in the process of classifying the facts of human geography, devises an ingenious way of bringing population under the umbrella of geography. As noted earlier, he concludes that the earth's covering of human dwellings is a phenomenon more geographical than the people who created them and that geographical demography is essentially the demography of the habitation. "The human fact as a force applied to the transformation of the surface of the earth will manifest itself as an explanatory and cooperating factor in each of the visible and tangible results of transforming work: apropos of the cultivated field or the mine men will have to be studied insofar as they determine these facts and insofar as they remain connected with them."¹⁷ "It is in connection with the house, the village, and the city that the question of the distribution of population must be examined—under its real and logical aspect— . . ."¹⁸ And Bruhnes proceeds to classify and analyze the facts of human geography through a study of the works of man and not of man himself, or population.

It appears, therefore, that the common two-fold subdivision of geographical science into physical and cultural has failed to provide a special niche for population. Thus the utilizer of the natural resources, and at the same time the creator of the cultural earth, tends to be neglected. It is for this reason that I propose a basic modification in the structural outline of content for geography in order to give population a more explicit position and one which its importance

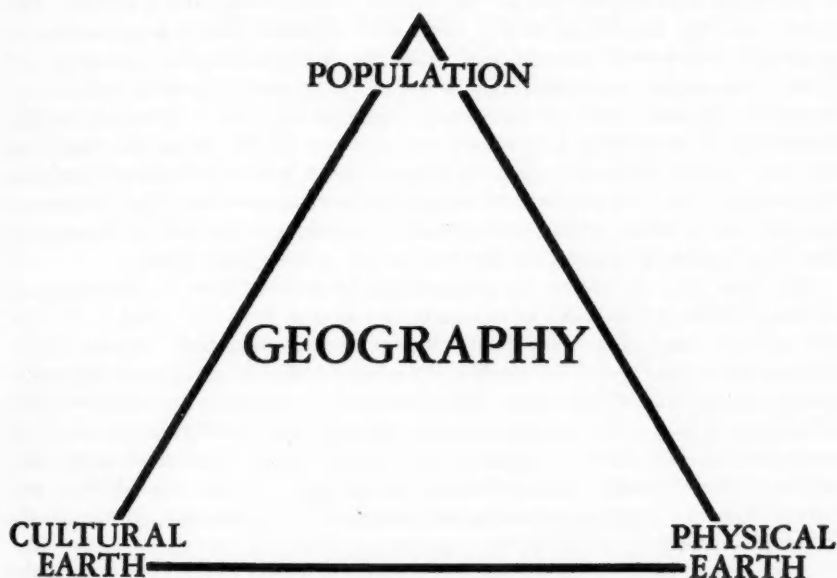
¹⁵ Italics mine.

¹⁶ *The Encyclopedia of the Social Sciences*, Vol. 6, p. 622

¹⁷ *Human Geography*, pp. 65-66.

¹⁸ *Ibid.*, p. 67

rightfully warrants. In place of the customary bifurcation into natural and cultural elements I propose a three-fold organization of the elements in which man, the physical earth, and the works of man are the triad of elemental groupings. 1) Man, the creator and originator of the cultural landscape, as well as the beneficiary of his own production; 2) the natural earth, which provides the environment and the raw materials for the use of man the creator; and 3) the cultural earth, which is the product of man's creation from the natural stuff—these are the essential groupings within a unitary geography. Thus, while the common binomial subdivision of elements into physical and cultural leaves population in a somewhat penumbral position, which may in part account for its neglect, the here-suggested



trinomial organization results in giving man his deservedly explicit and important position within the unitary geographical structure. The only *final* value is human life or human living, and this being the case it is difficult to understand why geographers should judge the creations of man, and the environment out of which he creates them, relatively more important than man himself. Neither does it do justice to the importance of population to include it as a third-order subdivision within the geographical hierarchy—a branch of settlement geography, which in turn is a branch of human geography, which itself is one of the two main subdivisions of the parent stem. I am making a plea for a trinitarian approach to our science in order that population can no longer be neglected because it does not appear to fit satisfactorily into a structural classification which recognizes only physical and cultural elements.

Lest my suggestion be misunderstood, I repeat that I abhor having this interpreted as meaning I would willfully aggravate the divisibility of our science by recommending three instead of two kinds of geographies. I reiterate my belief in a unitary geography. But I do contend it should be recognized that this sturdy plant has three main subdivisions of its elements instead of the customary two.

A second reason which may be offered for the minimizing of the importance of population by geographers is associated with the inclination to define geography as the study of landscape and to make the two terms, geography and landscape, synonymous. Granted that the definitions of landscape are numerous, there is, nevertheless, a widespread tendency, both at home and abroad, to limit landscape to the visual aspect of an area or the external forms of the earth's surface. The expression, "the face of the earth," fairly well indicates what a large number of geographers apparently have in mind when they employ the term landscape, and make it synonymous with geography. It may be granted that, either individually or collectively, man usually is not a visibly conspicuous element of the total earth's surface, or of most of its individual areas, and one cannot escape the conclusion that this lack of conspicuousness may be a reason why morphologically-minded geographers give to population *per se* an unimportant position. One suspects it was this line of thinking that led Bruhnes to consider houses and settlements as more fundamentally geographic than the people who created them.

But man does not derive his geographical importance from the percentage of an area covered by the bodies of human beings or even from their total bulk. It is not so much the visibly conspicuous element of men, viz., their physical bodies, which change the face of the earth and are geographically significant, but rather men's minds or their knowledge, and these are not a visible landscape element. Geography is more than visual landscape although the visual landscape is often, and quite correctly, the starting point in a regional study. Nevertheless, it is this common preoccupation with the form or visual picture of an area which in part may account for population having been relegated to an inferior position in the geographic system.

Somewhat corollary to the second reason, as stated above, for the relative neglect of population geography may have been the increasing emphasis during the past several decades upon geography as a direct observational science utilizing skill in field observation. A high degree of preoccupation with the readily observable landscape features quite naturally led to emphasis upon first-hand observation. But the inconspicuous nature of human beings, as well as their fluidity of movement, makes it difficult to study many of the facts of population at first hand. As a result relatively more reliance must be placed upon the statistical and cartographic analysis of census materials. This inability to make as abundant use of direct observation methods in the study of population as compared with many other phenomena may, I believe, have tended to turn geographers away from the demographic aspects of their subject.

It has been suggested, also, that the relative recency of a demographic meth-

odology and technique may have had a discouraging effect upon geographers interested in population studies. I am inclined to doubt the validity of this argument and for the reason that geographers did not make effective use of those methods that were currently employed by demographers. But even if one were to admit the argument as having been operative in the past, it needs to be emphasized that as of the present the situation is reversed, for the tools now employed by demographers are so numerous and so specialized as to require a high degree of technical training in order to be able to use them effectively. The total effect of the formidable modern demographic techniques may be more discouraging to geographers than was the alleged dearth of techniques in an earlier period.

THE POSITION OF MAN IN GEOGRAPHY

In our science, the central theme of which is area differentiation, the dynamic and pivotal element is human life, or population. This is not to claim that people should be directly the object of study to a greater extent than climate, systems of land use, transportation patterns, etc., but rather to suggest that fundamentally geography is anthropocentric and, if such is the case, that numbers, densities, and qualities of the population provide the essential background for all geography. *Population is the point of reference from which all the other elements are observed and from which they all, singly and collectively, derive significance and meaning. It is population which furnishes the focus.*

Physical Geography

Reverting to my previous remarks concerning a division of the unitary field into physical and cultural elements, it may seem most difficult to apply the concept suggested in the preceding paragraph, in what is usually thought of as physical geography. There is no such thing as a non-cultural man, and for this reason men cannot be considered as elements of a non-cultural division of reality. Therefore my contention that geography, including physical geography, is anthropocentric, cannot rest upon a fallacious premise such as that which would classify primitive peoples as an element of nature. Rather it has its defense in historical precedents and in modern trends.

Of genuine importance to the argument is the fact that during that period of the late 18th century when the theoretical concepts of the new science of geography were being developed, and its foundations were being sought in the physical features of the earth, contemporary geography had a highly anthropocentric slant. Throughout this pre-Humboldt-Ritter period most geographers followed Kant in viewing physical features in terms of their resource potentialities for supporting human life.¹⁰ To be sure, the central theme was the physical earth, but it was the physical earth as the home of man. And while there are many who subsequently have deviated from this point of view, it has never been abandoned. In fact, recent years have seen a reemphasis of the resource aspect of physical geography so that

¹⁰ Richard Hartshorne, *The Nature of Geography*, pp. 47-48.

geographical climatology, geographical geomorphology, and geographical pedology are more to the forefront at present than ever before. Clearly the classifications of climate now in vogue among geographers have a point of view which emphasizes human use, as do those of soils and native vegetation. R. J. Russell's 1948 presidential address²⁰ before this Association made a plea for a more geographical treatment of surface configuration and in 1950 John E. Kesseli²¹ spoke to the Association of Pacific Coast Geographers in the same vein. If not explicitly stated, it is certainly implicit in the published versions of these significant addresses that human-use quality is a major criterion to be used in the selection of those aspects of land-forms to be geographically studied.

Consciously or unconsciously, therefore, a group of modern physical geographers is reemphasizing the resource aspects of the non-human earth in their writings. But the resource concept is functional; it always implies human needs. An earth without population lacks resources, for the very word resource implies human wants.²² There is a distinction, therefore, between *physical earth* and *resource equipment*, for the latter is an expression of appraisal in terms of human usefulness, including both positive and negative elements. The concept of natural resources as so many bundles of raw materials piled up in a storehouse is false. Coal is black rock; it becomes a resource only to those populations who want it and know how to use it. Actually the term, resource, refers less to the corporeal aspects of a thing or substance than to the function which that thing or substance may perform. In a very real sense raw materials do not exist; they are human creations. Of necessity the resource concept is dynamic, not static, for it varies with the cultural stage of a people and with their economic development, so that the resource base changes as men's civilizations, and therefore their abilities and needs, change.

What I am attempting to say is that much of even physical geography is anthropocentric in character and its materials for study are selected having in mind their importance for the populations of the earth. (Admittedly it is those populations with European backgrounds that have provided the bases for selection.) The relative usefulness of the various physical elements is determined not by nature, but by man. It follows, therefore, that our systems of classification in physical geography must have a human basis, and that any physical geography oriented with respect to the resource concept is obliged to be cognizant of the population element. In view of the fact that it has been those with European backgrounds who have written most of the treatises on physical geography, it would be enlightening to see what might come from the hands of natives of the Congo, the Sahara, or the arctic tundra.

²⁰ Richard Joel Russell, "Geographical Geomorphology," *Annals of the Association of American Geographers*, XXXIX (March 1949): 1-11.

²¹ John E. Kesseli, "Geomorphic Landscapes," *Yearbook of the Association of Pacific Coast Geographers*, XII (1950).

²² For a more comprehensive treatment of this dynamic concept of resources see: Erich W. Zimmermann, *World Resources and Industries*, 2nd Ed., Part I; Isaiah Bowman, *Geography in Relation to the Social Sciences*, pp. 34-37; Isaiah Bowman, "The New Geography," a radio talk subsequently published by the United States Rubber Company; and Eugene Holman, "Our Inexhaustible Resources," *The Atlantic Monthly*, CLXXXIX (June 1952): 29-32.

Cultural Geography

But if much of modern physical geography is anthropocentric in character because of the connection between the physical earth and population by means of the resource concept, how much closer and more direct is the connection between the cultural earth and population. At the risk of stating the commonplace, it may be noted that the cultural features which embellish the earth's surface in almost limitless combinations as developed through time are the evidence of successive periods of human occupancy. From culture may be read the chronicle of population, its ebb and flow, its accomplishments and defeats, for culture accurately reflects the numbers, and even more precisely, the qualities of its creators. Man, the creature unlike all others, who has emancipated himself from passive adaptation and natural selection, is the one animal that is able to change the environment to fit his needs. His uniqueness and preeminence are to be discovered not so much in the excellent qualities of his body as in his superior wisdom and intelligence. To be sure, the resource base is still the foundation of human enterprise even in the most advanced civilizations, but to an ever increasing extent the resources of civilized man are not natural resources, but human inventiveness, experience, and knowledge. Thus the total culture within an area develops its unique and distinctive characteristics partly as a result of population numbers, which suggests intensity of use, but even more it reflects the socio-economic qualities of the occupying group. Quality of population counts for more than mere numbers, and culture is more the product of men's minds than of their bodies. The greatest transformation of the natural area results when population is not only numerous, but likewise advanced in technology.

Man's connection with the cultural earth is at the same time active and passive. He is ". . . both the most dynamic agent of production and the beneficiary of the entire process of resource development and utilization."²³ In his role as an agent of production he transforms the surface of the earth for his own use. But he is also the end object of the entire process of production for he reaps the harvest of material goods and enjoys the advantages of developing civilization. It is in this dual role, both as producer and as beneficiary of the civilization created, that population becomes the most potent and dynamic regional element. The cultural earth as an object of geographic study is thus a product of the totality of population attributes and is not to be understood apart from the human resource which produced it.

THE APPROACH TO POPULATION GEOGRAPHY

I have indicated earlier my belief that geography is a unitary discipline. Physical and cultural, systematic and regional, general and special, are dualisms which appear at times to fog this oneness. As geographers I believe we are committed to the study of earth regions. But the concept of region cannot be divorced from the fact that an area has reality only in terms of the specific groups of interrelated elements which comprise it, and can be studied only in terms of these elements which are the topical or systematic specializations of geography. Moreover, the

²³ Zimmermann, *op. cit.*, p. 91

study of the elements of areas, individually or in groups, where the regional concept is always implied, is no less "regional" in quality than is the holistic type of area analysis. Constant emphasis of the mosaic method of treatment as regional geography *per se* has obscured recognition of the fact that the topical approach can be equally regional. Consequently, in subscribing to the chorographic point of view, I am not thereby committing myself to a defense of the mosaic or holistic approach to studying areas, or of agreeing that such studies necessarily are the purest form of regional geography.

Among the various groups of elements which cause earth regions to differ, population is one. It is not just one among many, however, for as stated earlier, population is the pivotal element around which all the others are oriented. Indeed, it is only from man or population that these other elements derive geographical significance. Consequently, the study of population is logically the single most important topical approach to geography and one in which the regional concept has its broadest application. To be sure, geography does not claim to be the science of man, but it does include within its circumference man in his reciprocal relationship to the earth area.

For some time it has been my conviction, growing out of experience, that while an understanding of places may be the desirable goal in geographic research and instruction, the goal normally is best attained by the topical approach.²⁴ Experience seems to show that the groups of phenomena represented within most regions are too numerous and too complex to be handled expertly in their complicated interrelations by one person at one time. This may account for the fact that many of our holistic regional studies appear to be relatively superficial and lacking in fresh approach. It is as though the plowshare consistently reached to about the same depth and so did not involve new materials. As a consequence the mosaic method of geographic analysis has many times appeared monotonous.

Regional analysis of a superior quality requires the highest type of mature scholarship and is not to be undertaken by amateurs. In general, it must be based upon the work of systematic specialists, or it may be the combined product of several systematic specialists. For this reason I am led to conclude that the training of our advanced graduate students, even those who are professed regionalists in interest, should include work in a number of systematic fields and a greater degree of experience in at least one. This is only a recognition that the effective tools and techniques of regional analysis are provided by the several systematic branches of our science. It stems from a conviction, also, that regional geography is in danger of becoming sterile without constant insemination from the topical branches.

If the view is accepted that the most expert way of approaching an understand-

²⁴ This point of view has been admirably expressed in an essay by Edward A. Ackerman in which he gathered together experiences resulting from his wartime services in Washington, D. C. See, Edward A. Ackerman, "Geographic Training, Wartime Research, and Immediate Professional Objectives," *Annals of the Association of American Geographers*, XXXV (Dec. 1945): 121-143.

ing of a region is by the route of topical analysis rather than that of mosaic description, and if in addition it is agreed that population is the pivotal element in geography, then it follows that an adequate treatment of the population element in regional studies requires that population geography be developed as a systematic specialty. Evidence already has been presented to indicate that such a systematic specialty does not exist either in this country or abroad. Here is a situation that requires correction. I entertain serious doubts whether the population element can possibly receive adequate treatment in comprehensive regional studies and in regional courses of instruction until the field of population geography is developed as a specialized systematic branch of our science. Concrete evidence pointing to a recognition of this fact is required in the form of 1) population specialists on our geography staffs; 2) courses of instruction in population geography in our professional training programs; and 3) a greater abundance of scholarly publications in this field.

A SYSTEM FOR POPULATION GEOGRAPHY

It is not my purpose here to establish a rigid plan or outline for population geography. I desire only to make suggestions relative to its core content, with this content arranged into a tentative and flexible system which will allow ample latitude for needed modifications growing out of different needs, variable data, and contrasting regions. Since this is in the nature of a first attempt to create such a system it is to be expected that it will be changed and modified as it is put to the test of continued use by workers in the field. There is bound to be lack of agreement on the full content of the field of population geography and admittedly there is no one way or best way of ordering and arranging the topics to be included. Still, in most disciplines and branches of disciplines, there is a core of content on which there is reasonable agreement, even though the full content and its arrangement may bear the stamp of individual authorship. This, it is believed, should be the case with population geography.

It is my hope that this preliminary attempt at the development of a system of content for population geography may have the effect of inducing others to share their experiences and to express their ideas on the topic. Such contributions should make it easier for geographers to plan courses on population and to visualize the research aspects and opportunities in the field. It will be of great value if the geographers working on population are enabled to work cumulatively, to the end that their research may build more rapidly toward a complete and unified structure. At the same time it is believed that the development of a system of content for population geography should have a beneficial effect upon regional geography in general, expressed either through courses of instruction or through research studies.

The geographer's goal in any or all analyses of population is an understanding of the regional differences in the earth's covering of people. Just as area differentiation is the theme of geography in general, so it is of population geography in particular. But I emphasize that the concept of differentiation applies to a wider range

of population attributes than most geographers have ordinarily included within the scope of their studies. Simple distribution patterns and arithmetic densities are scarcely sufficient to establish a field of population geography.

The outline of content developed below is intended to be generally applicable to the area analysis of population. It is intended to fit areas of all sizes ranging from the earth as a whole down to localities. It is meant to be suggestive of the kinds of population features to be observed and compared in different areas.

Population Geography

A tentative system of content and organization

- I. Geography of population in the past—how the earth was populated.
 1. Prehistoric
 2. The ancient world
 3. The medieval world
 4. The modern world
 - a. Pre-census periods
 - a¹ Comparative population growth in the great world regions
 - a² The European migration and the spread of western technology.
 - b. The period of the great national censuses
 - b¹ The differential quantity and quality of population data.
- II. Population numbers
 1. Gross pattern of world population numbers
 2. Dynamics of numbers
 - a. Differential rates of population growth
 - a¹ Area natality and mortality patterns and differentials
 - a² Age pyramids as indicators of future growth
 - a³ Area patterns involving crude rates of natural increase and net reproduction rates.
 - a⁴ Area change and variability of population
 - a⁵ Significance of area differential rates of population growth.
 3. Area aspects of overpopulation and underpopulation
 4. Distribution of population
 - a. Gross patterns of distribution
 - a¹ The ecumene and the non-ecumene
 1. The frontiers of the ecumene
 - (a) The polar frontier
 - (b) The dry frontier
 - (c) The wet tropical frontier
 2. The expanding ecumene and population growth.
 - a² Continental and subcontinental population distribution patterns.
 - b. Population distribution by settlement types
 - b¹ Size and spacing of settlement units as population clusters
 - c. Distribution of population density patterns
 - c¹ Arithmetic density
 - c² Physiological density
 - c³ Agricultural density
 - c⁴ General economic density (the man-land ratio)
 5. Migrations and movements of population
 - a. International migrations
 - a¹ Regions of out-migration and its effects

- a² Regions of in-migration and its effects
 - b. Intranational and local migrations
 - b¹ Rural urban migrations
 - b² Seasonal migrations
 - b³ Diurnal movements
- III. Qualities of population and their regional patterns of distribution
 - 1. The physical qualities of population
 - a. Body size, form and color
 - b. Race and nativity
 - c. Sex balance
 - d. Age composition
 - e. Health and disease
 - e¹ Diet and nutrition
 - 2. The social-economic qualities of population
 - a. Religious beliefs
 - b. Educational status
 - b¹ Schooling
 - b² Illiteracy
 - c. Occupational status
 - d. Marital status
 - e. Residence; rural or urban, including size of settlement
 - f. Stage of economic development
 - f¹ Use of inanimate power of mechanical robots
 - g. Customs, habits, prejudices, loyalties, etc.

HISTORICAL POPULATION GEOGRAPHY

Little of a specific nature is known concerning the population of the earth and its individual parts for more than a few centuries back. Even at the present time no census data of any kind exist for perhaps as much as 8 per cent of the earth's people and for 25 to 35 per cent it is fragmentary and inadequate. A century ago at least 80 per cent of the earth's inhabitants had not been counted. Consequently any treatment of population growth in past centuries is based upon estimates derived from very fragmentary circumstantial evidence. Population figures prior to about 1750 are only the means of a number of inferences.

But if direct statistical evidence is lacking, there are still indirect methods available to the geographer for arriving at conclusions regarding the number, density, and quality aspects of population in the pre-modern world. The anthropologist, for example, has developed methods for relating population density to the stage of culture in which a people is found. It has been determined that it is very unusual for a race that has no knowledge of agriculture to reach a population density greater than one per square mile.²⁵ By means of stage of culture and other types of evidence Kroeber has attempted to reconstruct the pre-white Indian population of North America.²⁶ Attempts have been made, likewise, to relate present-day popu-

²⁵ A. M. Carr-Saunders, *Population*, p. 10. On this topic see also: A. B. Wolfe, "The Fecundity and Fertility of Early Man," *Human Biology*, V: 37-38, and Abraham Clarke, *Archaeology and Society*, pp. 174-182.

²⁶ Alfred Louis Kroeber, *Cultural and Natural Areas of North America*, pp. 131-181.

lation distribution over the world to stage of economic development.²⁷ It appears to have been established by archaeologists that the first important upsurge in world population was contemporaneous with the Neolithic Revolution in which the food gathering of Paleolithic man was supplemented by the cultivation of crops and the domestication of animals. Still another acceleration of population growth is associated with the second revolution which witnessed the development of urban culture based upon trade and the processing of goods, the prelude to which was a series of epoch-making inventions.²⁸

As a phase of historical geography this analyzing and mapping of population in past periods, both prehistoric and historic, appears to be a fertile field of research. It is of a type that suggests the need for interdisciplinary teamwork in which geographers with great profit might combine their efforts with those of anthropologists, demographers, and economic historians. My experience with a graduate seminar on population in which anthropology students were collaborators convinces me of the possibility for doing fruitful work in this frontier field of the historical geography of population.

THE DYNAMICS OF POPULATION NUMBERS

Although there can be no doubt that among the data on regions used by geographers none is more important than numbers of people, in practice such data are treated usually in an abridged form, and less commonly in their dynamic aspects. For while present numbers are highly important, such data take on greatly added significance if they are viewed as a changing and developing fact that has both a past and a future. How the population of a locality, a region, a State, or even a continent, came to be what it is today in comparison with those of other areas, and how its population may compare at some future date, is associated with such items as birth rates, death rates, fertility ratios, net reproduction rates, in-migration, and out-migration; kinds of facts to which geographers ordinarily give little attention. The differential rates of population growth in the past, in localities as well as in States, have been of the utmost importance and will continue to be in the future. Any comprehensive geographical analysis of a region should, therefore, take into consideration this fact of differential growth both as it applies to areas beyond and outside the region in question, and likewise to the several localities which comprise the region. Both interregional and intraregional contrasts in differential rates of growth carry in their train economic, political, and social consequences which the student of social and cultural phenomena may not ignore.

The rapidity with which a population is reproducing itself is the most basic and significant of all social and economic phenomena. This being so, methods for accurately measuring human fertility and mortality are of paramount concern. Three principal indicators of fertility in human population have been developed. These

²⁷ Mark Jefferson, "The Anthropography of North America," *Bulletin of the American Geographical Society*, XLV (1913): 161-180.

²⁸ V. Gordon Childe, *Man Makes Himself*.

are the birth rate, the fertility ratio, and the net reproduction rate. Most used of these, because it is simplest, is the birth rate, and the crude birth rate at that. But crude birth rate, or the ratio of births to total population, is a most unreliable gauge of human fertility. Variations in the age and sex composition of populations are great and unless allowance is made for these irregularities, it is impossible to compare the reproductive tendencies of the populations of different regions. Much the same criticism can be made for crude death rate figures. At least the specific death rates for particular age and sex groups should be used in making regional comparisons. Still more significant in the study of regional mortality differentials are data showing the average duration of life or the expectation of life.

Two relatively recent improvements have made the characteristically inadequate treatment by geographers of the population element in regional analyses somewhat indefensible. The first of these is the greater abundance of more accurate data on the population of more of the world's areas than were ever before available. This is only a relative improvement, to be sure, for the deficiencies are still discouraging. But as Hettner has pointed out, the geographer in his study of population, unlike the demographer, is not limited to areas for which a series of reliable censuses have provided good statistical data. Through the employment of such *indirect* methods as, 1) a study of large-scale maps showing settlements or physical characteristics, 2) the application of information on the nature and intensity of land use, and 3) an analysis of aerial photographs, as well as the *direct* method of personal observation in the field, the geographer is able to draw valuable conclusions regarding population in areas for which the census data are few and unreliable. The second improvement is the unusual progress made in recent decades in the techniques of statistical demography which provide greatly widened opportunities for geographical research, especially as it is related to comparative studies of regions and localities. No longer can the conscientious geographer be satisfied with a static treatment of numbers, or contended with a reliance on crude birth rates and death rates as tools for measuring probable population change.²⁹

POPULATION DISTRIBUTION

It is in the distributional aspects of numbers of people that geographers appear to have made their chief contribution to population study. This may stem from the fact that number distribution lends itself particularly well to representation on maps.

All distributional aspects of numbers of people are nearly inseparable from the concept of population density. It is impossible to discuss distribution without indicating that there are more in some places, leading to relatively higher densities, and fewer in others, leading to lower densities. But much of our mapping of distributions, and our discussions likewise, are concerned with the patterns of *relative* density distributions and not with absolute densities. In this discussion the term density will be understood to refer to absolute density. For the moment, however, the concern is with the distribution of relative densities.

²⁹ Louis Chevalier, "Demographie et géographie," *Annals de Géographie*, LVI (July-September, 1947) : 201-202.

Ecumene and Non-ecumene

Distribution of people in its broadest aspect, or global scale, involves dividing the land portions of the earth into permanently inhabited as compared with uninhabited, or temporarily inhabited, parts. The terms ecumene and non-ecumene have been employed to represent these two major subdivisions. The non-ecumene is composed of extensive contiguous areas as well as of smaller non-contiguous islands imbedded within the ecumene. Principally the non-ecumene is composed of the cold lands (chiefly high latitudes, but also high altitudes), the dry lands, and the wet tropical lands. The foremost active settlement frontiers exist where population is endeavoring to establish itself in the face of increased duration of low temperatures, increased drought, and increased heat and humidity. The degree and rapidity to which population can force the advance of these frontiers is a topic which can scarcely help but attract investigation by geographers. During the past two centuries unprecedented overseas migrations of Europeans and their culture have expanded the ecumene on a scale never equalled previously so that it appears to some that the physical earth is at present well explored economically and population has become increasingly stabilized. In other words, present population differences more closely reflect the comparative economic potentialities of areas than at any time in world history.³⁰ While this may appear true, especially to peoples of European culture, there is less certainly as to whether Orientals and natives of the tropics would completely agree. It may be that our particular culture makes us myopic concerning the opportunities which portions of the non-ecumene offer.

The most active advance of settlement along the cold frontier within the last quarter century has certainly occurred in the European sector under the stimulus provided by the Russian Communist government. The methods and techniques employed, while deservedly under suspicion, are worthy of careful study. As of 1931 the population of the Soviet Far North had a population of about 1,000,000 people. In 1939 the same region contained about 2,500,000 people.

New interest in the dry frontier of settlement has very recently developed as a consequence of successful experimentation with methods of artificial rain-making. It is a certainty that supercooled clouds have been caused to precipitate as a result of seeding them with dry ice and silver iodide crystals. Among experts there are strong differences of opinion, however, relative to whether artificial rain-making can have sufficiently large-scale effects so as to be of genuine economic significance. Some who are doubtful about its value in humid climates appear to be willing to admit greater potentialities for cloud seeding in dry regions, especially where mountains are present.

Unlike the other two types of non-ecumene, the wet tropics, instead of having serious climatic deficiencies, actually are characterized by a superabundance of climatic energy. It is neither deficiency of heat nor deficiency of rainfall which has discouraged settlement in parts of these low latitude areas. Moreover, there are at present numerous examples of unusually dense native population in some

³⁰ Carl O. Sauer in *Limits of Land Settlement*, Isaiah Bowman ed., p. 9.

areas within the wet tropics, although other sections, chiefly located in the New World, remain largely unpeopled. Here then is a frontier whose density differentials suggest problems of an importunate nature demanding attention. If the agricultural techniques of the Asiatic tropics could be transplanted to Africa and the Americas the effects upon population growth in the latter regions might be startling. Perhaps there is good reason for shifting our interest from the settlement potentialities of the wet tropics for white peoples, to one which focuses on the low latitudes as a pioneer area for the expansion of native tropical peoples and for Orientals.

Population Distribution by Types of Settlement

While geographers have tended to concentrate their attention upon the distributional aspects of population numbers, they have, on the other hand, limited their efforts chiefly to that phase of the topic dealing with what I shall call *gross* distribution. By comparison they have seriously slighted that other important aspect of distribution which seeks to understand the characteristic size groupings of population as exhibited by settlement units. It is this aspect of distribution which is most conspicuous when population is observed in the field rather than by means of the census.

Some of the finest and most detailed maps of population distribution known for any region of the earth are available for Japan, yet these do not exhibit that element of distribution arising from the degree of nucleation. A similar situation exists with respect to most other regions of the world. Almost all of the world's population shows some degree of clustering or nucleation. Man is a gregarious animal and, as a consequence, rarely lives singly and alone. In some parts of the world population is predominantly clustered in tiny units comprising single families. In others the population clusters are somewhat larger and form hamlets and villages, and in still others larger urban units predominate. Composites of these forms are common. One of the best examples of an attempt to combine the concepts of gross distribution and settlement distribution of population is Sten de Geer's study of Sweden.³¹ Through the use of unarranged or scattered dots for dispersed population, clusters of arranged dots for small nucleated settlements, and graduated spheres for larger clustered settlements, this Swedish geographer has been able to produce a map which exhibits not only gross patterns of relative densities, but in addition certain elementary concepts of the degree of population clustering.

It is my belief that an analysis of population distribution in terms of settlement size and spacing is a neglected aspect of population geography worthy of serious attention. Much of this work may take the form of representative locality studies which will serve the purpose of supplementing other maps showing the gross patterns of distribution. Quite a different form of this type of study, and one representing the other extreme from the suggested locality study, was undertaken in

³¹ Sten de Geer, "A Map of the Distribution of Population in Sweden: Method of Preparation and General Results," *Geographical Review*, XII (1922): 72-83.

one of my graduate seminars in which the goal set was a generalization of the patterns of rural population nucleation for the entire earth. The end product was a world map which by the use of four color tints showed the distribution of four degrees of nucleation. I consider the project to have been a success as far as it went, but the fact that the resulting map has never been submitted for publication indicates its tentative and incomplete character.

Population Density

Men and land are the ultimate elements in the life of human society so that the number of people in proportion to the amount of land is a fundamental consideration in population study. The concept of density, or the relationship between people and land, is usually expressed as a simple arithmetic ratio which divides total population by total area. This common expression of density, while it is not without some value geographically, in reality provides only the most superficial representation of the real pressure of population upon the resource base.³² Such a simple ratio is unsatisfactory because it expresses a quantitative relationship between two elements which in themselves are highly inconstant. The numerator, or total population, represents men of greatly contrasting cultures and stages of economic development whose demands upon the physical earth stand in great contrast. The denominator of the ratio expressing units of area fails to take into consideration the variable capacities of different environments for supporting human life and satisfying human wants.

Because the data required by the ratio $\frac{\text{population}}{\text{area}}$ are the most readily obtainable, arithmetic density no doubt will continue to be used by geographers. However, their recognition of its unsatisfactory character will cause them to employ more accurate indices of population pressure on the resource base when the data and techniques are available. *Physiological* density, expressed by the ratio $\frac{\text{population}}{\text{arable area}}$ is a somewhat more refined concept of density since it eliminates from the denominator barren areas and others not suitable for agricultural production. On the other hand, it errs in eliminating all productive non-arable land such as forest, natural pasture, scenic land, mining land, etc. It likewise errs in continuing to evaluate all arable land as having the same productivity, and rating populations as having the same capacities no matter what their cultural background or stage of economic development. Some attempts have been made by geographers to express the physical productivity of agricultural land by means of numerical indices.³³ Thus far their success does not seem to be marked, but if a method could be found

³² For a discussion of different kinds of population-density indices, see, Dr. Imre Ferenczi, *The Synthetic Optimum of Population*, International Institute of Intellectual Cooperation, League of Nations, 1938.

³³ See especially a group of papers in *Comptes rendus du Congrès International de Géographie*, Amsterdam, 1938, Volume 2, Sec. 111b. *Economic Geography*, pp. 174-228.

for evaluating quantitatively the agricultural productivity of different environments it would be possible to weigh the denominator in the physiological-density ratio so as to get a more realistic comparison of population density in different physical environments.

Agricultural density is expressed by the ratio, $\frac{\text{agricultural population}}{\text{cultivated area}}$. Obviously it can serve as an index of general population density only in those regions where agricultural population forms a very large proportion of the total. It represents no advance over the other types of density in differentiating between different qualities of environment or of men.

But even these more specialized ratios still fall short of being able to express the man-land ratio in its fullest meaning, or what is called the *general economic density* of population. The numerator of such a ratio should involve not alone numbers of men, but also their socio-economic qualities, including stage of technological advancement. The denominator should denote not just total area, or even cultivated area, but rather the sum total of the natural resource equipment, so that it essays to express the capacity of a region's natural environment to support human life at a particular stage of development. In primitive closed societies the carrying capacity of land may not be impossible to arrive at. But in highly complex dynamic societies a satisfactory means for measuring population pressure on the total resource base has never been accomplished. In advanced societies the means for supporting population often depends as much, or even more, upon items brought in from outside as upon those produced at home. A spatial gap is thereby created between the place of production and the place of consumption. Thus the internal carrying capacity of domestic resources becomes relatively less important as societies advance in technology and regional specialization.

Deficiencies both in data, and in methodological tools, for expressing quantitatively the real man-land ratio, or economic density, may compel geographers for the time being to continue to use arithmetic density and other simple ratios in their population studies. Even work in arithmetic density is made difficult for large areas of the world for which fairly detailed population data are available, because of a lack of base maps showing the boundaries of minor civil divisions, and of information concerning the areas of these subdivisions. These serious lacks call for a unified assault by such an organization as the International Geographical Union. But dissatisfaction with arithmetic density as an index for expressing the true man-land ratio likewise presents a challenge to geographers to produce something better. It is a challenge that should not be shunned for it is difficult to see who is so well equipped professionally to make a contribution to this phase of population research as is the geographer.

Population Quality

And finally I propose to direct my remarks to the topic of qualities of people, a facet of population study that has been much more seriously neglected by geog-

raphers than have the several aspects of number distribution. But numbers alone are deceiving and at best can provide only an incomplete, and often erroneous, impression of the relative importance of any phenomenon. Acres of wheat and numbers of livestock are important data to be sure, but their usefulness and significance are greatly increased if supplemented by other data indicative of quality, such as quantity and value of wheat per acre and quantity and value of output per animal. Each unit area under cotton in Egypt yields five times as much cotton fiber as a comparable area in India and the ratio is still more exaggerated if value is substituted for weight. What is being sought here is not mere number of acres or of animals, but, in addition, the *quality* of the crop or livestock as indicated by density of stand, value of output or some other measure of excellence or intensity.

But while most of the world's things are measured, and their distributions indicated, not alone in terms of numbers but also in terms of quality or value, geographers continue to treat human beings in terms of numbers almost exclusively. The identical number of points or dots is made to represent 1000 illiterate natives of Amazonia and 1000 highly civilized citizens of Sweden, even though they represent quite different potentialities both as producers and consumers. Certain it is that how man uses the earth and what he does to its surface, how much he produces and consumes, as well as his physical well being, in fact the sum total of his cultural accomplishments as expressed in the inclusive term civilization, is related not alone to mere numbers of people, but even more to their qualities. The seven per cent of the world's population living in Anglo-America, trained to use inanimate power and mechanical robots, is said to accomplish one-half of the world's work.

Just what the qualities of population are which significantly modify and supplement the concept of numbers is not always so clear. However, two main classes or subdivisions of quality may readily be recognized: 1) those which are physical in character and are chiefly attributes of the bodies of men, and 2) those which are cultural characteristics, socio-economic in nature, and hence indices of civilization.

Many bodily features such as skull form and size, body weight and height, color of hair and skin, etc., appear to have little significance relative to man's potentialities either as a producer or a consumer. Of all of these, skin color alone may have some functional significance in this instance as it is related to climatic adaptation, but even such a connection is uncertain. Modern censuses usually tabulate three physical characteristics of population which are of considerable value in a comparative regional analysis of population quality. They are: race and nativity, balance between the sexes, and age composition. While race or nationality is not indicative of inherent potentialities, it is, nevertheless, often suggestive of cultural backgrounds, economic status, and differentials in terms of birth rates, death rates, intelligence quotients, and other important social indexes. The sex ratio of a population and its age composition likewise have far reaching significance.

Most important, without doubt, of all the physical characteristics of a popula-

tion, affecting both its production of wealth and its ability to enjoy the wealth produced, is the state of physical well-being of the people. The idea may be summed up in the word, health. That health is not identical with the absence of disease is obvious; still there is a relationship. Unfortunately medical science has paid little attention to people who are healthy, so that whatever information and statistics are available are those concerned with one negative aspect of health, viz., disease, and with individual diseases at that. Whole populations in part of the wet tropics are so infested with malaria, hookworm, dysentery, and other debilitating diseases as to make the people unfit for vigorous physical or mental effort and thereby adversely affecting the labor supply. Large parts of the world's population live at sub-standard levels of well being because their diets do not provide the necessary ingredients for good health. This problem of the differential health and well being of populations in various regions is a research frontier in population geography which has received altogether too little attention.

In addition to physical attributes which in a qualitative sense differentiate the earth's populations, there are those other qualities of individuals and groups which are cultural or socio-economic in character. These include, among others, religious beliefs, educational status, marital status, occupational status, place of residence (rural or urban), and stage of economic development, including use of inanimate power and machines. Less tangible qualities of a population, but perhaps no less significant, are such features as customs, habits, prejudices, degree of enterprise, and different kinds of loyalties and allegiances. Many of these qualities of population are not represented in census data, but are to be caught and examined only through first hand observation or by archival investigation. Some of these qualities greatly affect man as an agent of production; others are of more consequence in affecting man as a consumer and enjoyer of the fruits of his labors. Few of these socio-economic qualities as they affect the world's population have been worked out in even their general patterns, let alone their regional and locality details. They remain, therefore, a fructuous field for geographic research.

CONCLUSION

My conclusion is brief and can be expressed in the form of a syllogism.

Population geography as a topical subdivision of the general field has been, and continues to be, neglected, by students of social and cultural phenomena, including geographers who should have known better.

As the pivotal element in geography, and the one around which all the others are oriented, and the one from which they all derive their meaning, population cannot be neglected without doing serious injury to geographic science in general.

Therefore, it behooves professional geographers to correct the unfortunate situation, that now exists, just as promptly as possible. I shall refrain from making specific recommendations concerning the steps to be taken and instead urge that the Association of American Geographers undertake a study of the situation looking toward the proposal of a remedial program.

PATTERNS OF LAND USE IN NORTHEAST BRAZIL*

PRESTON E. JAMES

Syracuse University

THE Northeast of Brazil is a region of poverty and hardship because of the peculiar association of land quality and land use in that area. It cannot be said that the conditions of the physical and biotic environment condemn the inhabitants of the region to poverty; nor can it be said that people with the economic traditions of the Brazilians must always in the long run be a poor people. But the combination of physical and biotic conditions on the one hand with the economic conditions introduced by the Portuguese on the other has produced a region of poverty through the gradual destruction of the resource base. Some of the problems involved in doing something about the depressed level of living can be seen more clearly against the background of a geographic inventory of resources and of the patterns of resource use.

The area with which this report deals is shown on the map (Fig. 1). It differs from the Northeast as defined by the *Conselho Nacional de Geografia* in that it includes the whole of Sergipe and the northern part of Bahia whereas the Brazilians place the southern margin of the region along the São Francisco River. On the map the São Francisco is the large river which separates Bahia from Pernambuco and Sergipe from Alagoas.

A reconnaissance report on the character of the resource base was presented in a previous paper.¹ The map of land quality, defined as associations of slope, soil, and drainage, is reprinted here (Fig. 2); its categories are described in some detail in the first report. The two major physical and biotic divisions of the Northeast are the Zone of the Mata and the Zone of the Caatingas. The former occupies a narrow belt along the southeast coast extending from Natal and widening southward into Bahia. It is characterized by ample rainfall, over 1,000 millimeters, by reddish or yellowish clay soils, and by an original cover of tall tropical forest. The Zone of the Caatingas occupies the greater part of the Northeast, reaching the coast in Rio Grande do Norte, Ceará, and Piauí, and extending beyond the western border of the map.² This is a region with less than 1,000 millimeters of rain, with considerable irregularity in rainfall from year to year, a region covered with a forest of low, thorny, deciduous trees. In the midst of the Zone of the Caatingas are several "islands" of relatively heavy and dependable rain, once covered with mata,

* Based on field observations carried out in the early part of 1950. The field party was sent out by the *Conselho Nacional de Geografia*. Its chief was Lindalvo Bezerra dos Santos. The writer was "technical consultant" to the Conselho. He was assisted by Ney Strauch and Antonio Guerra. The first part of this report was published in the *Annals* in June 1952.

¹ Preston E. James, "Observations on the Physical Geography of Northeast Brazil," *Annals of the Association of American Geographers*, XLII (1952): 153-176.

² Fábio M. S. Guimarães, "Divisão regional do Brasil," *Revista Brasileira de Geografia*, III (1941): 318-373; reviewed *Geographical Review*, XXXII (1942): 493-495.

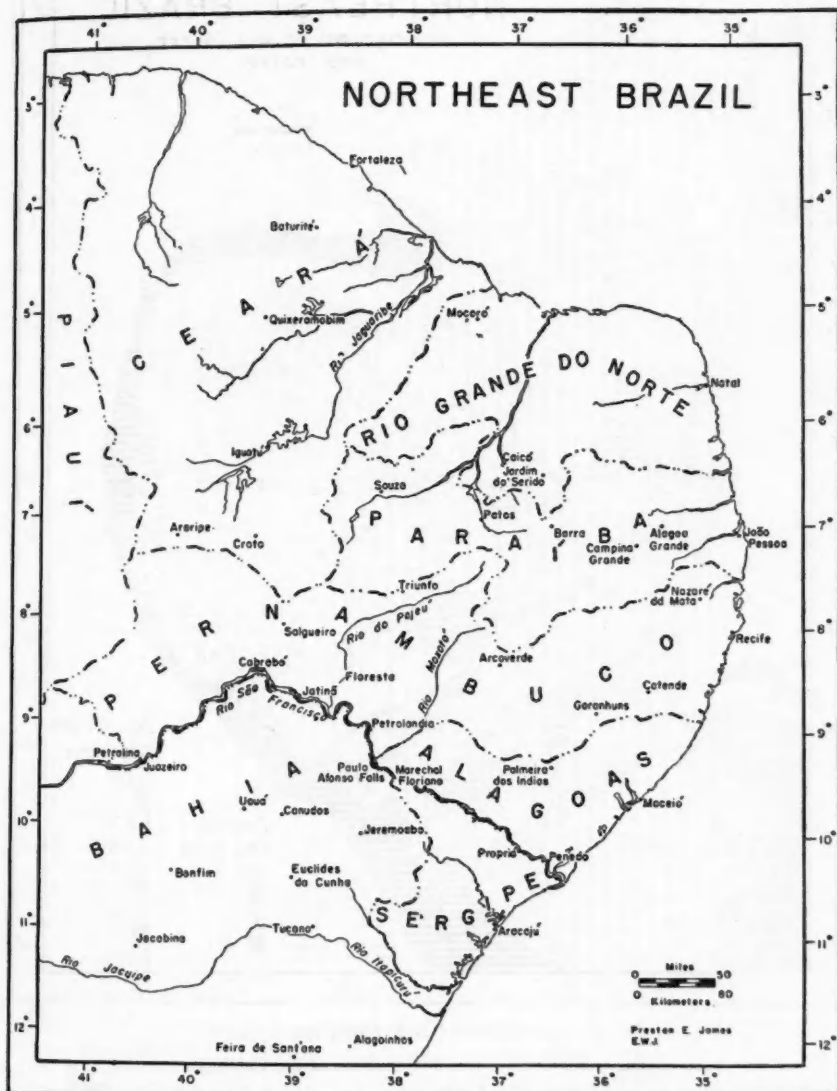


FIG. 1. Northeast Brazil, states and towns.

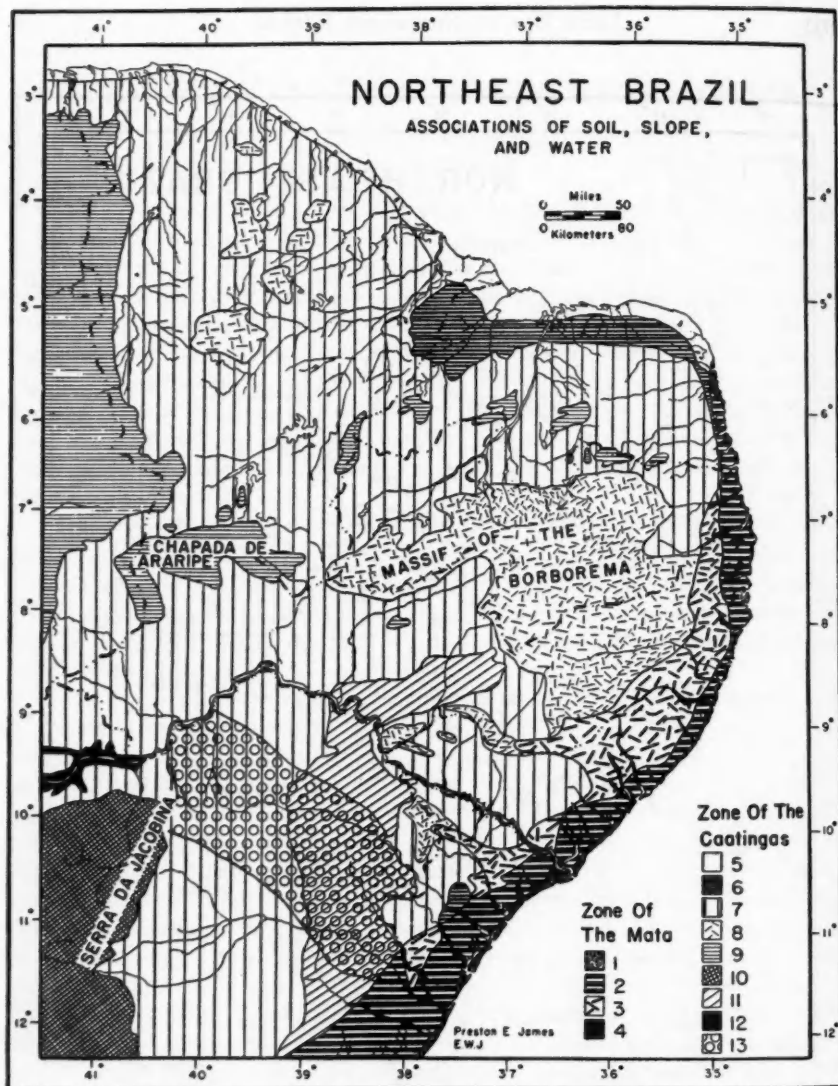


FIG. 2. Associations of Soil, Slope, and Drainage.

Zone of the Mata

1. The Shore
2. The Taboleiros
3. The Hilly Lands
4. The Floodplains

Zone of the Caatingas

5. The Shore
6. The Taboleiros
7. The Broad Plains with Erosion Remnants
8. The Massifs
9. The Sandstone Gap
10. The Serra da Jacobina
11. The Sedimentary Basin of Bahia
12. The São Francisco Floodplain
13. The Itapicuru Drainage Way

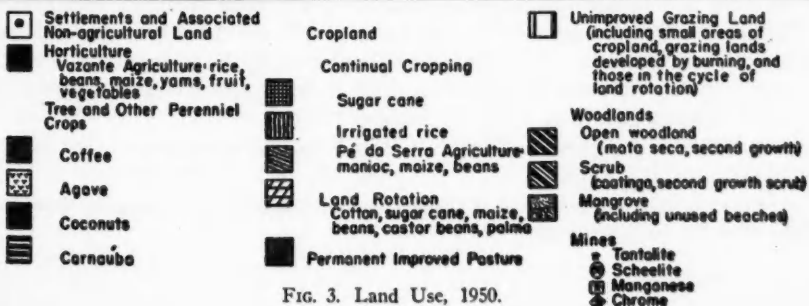
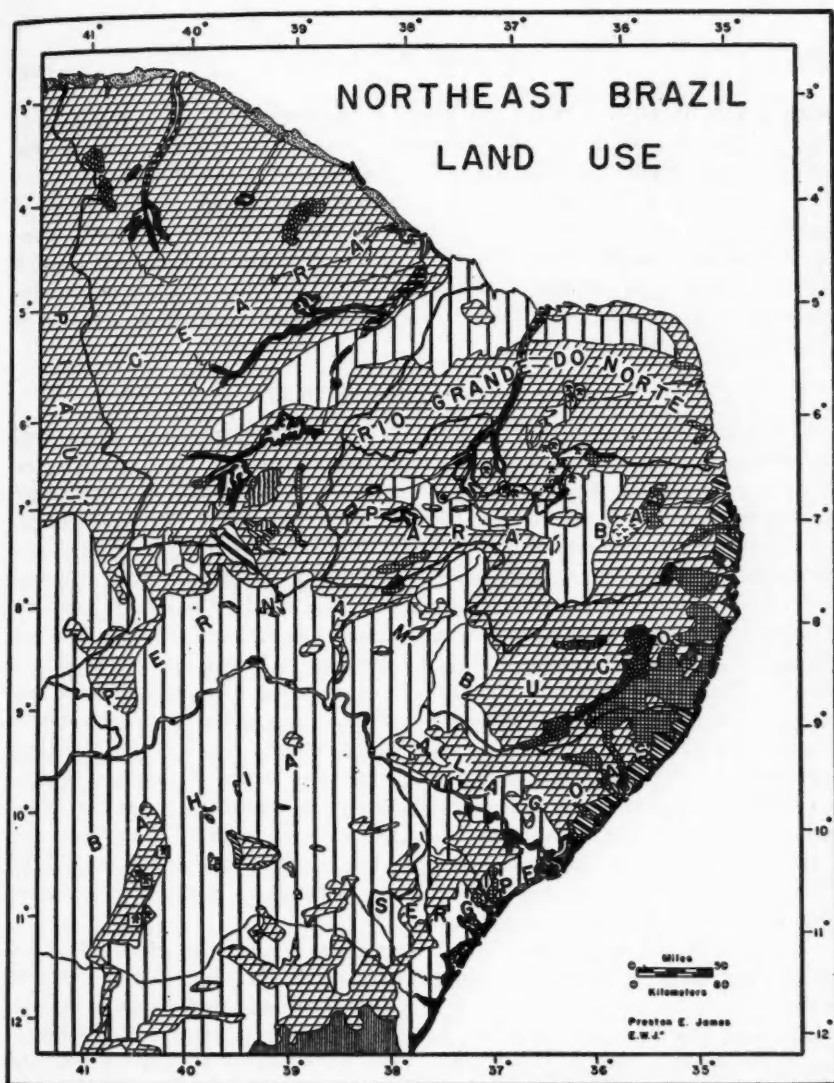


FIG. 3. Land Use, 1950.

which occupy the higher parts of the Massif of the Borborema, the Serra da Jacobina, and the Chapada de Araripe. Somewhat heavier rain is also received on the numerous hill groups that stand above the general level of the broad plains. The whole Zone of the Caatingas has coarse, porous soils through which rain water rapidly sinks below the surface, but the area of coarsest soil is the Itapicuru Drainage Way where a mantle of water-worn quartzite gravel crosses diagonally through northern Bahia. For the base on which this and all the other maps in the two reports were drawn, reference is made to the folded terrain map which appeared as Figure 1 in the first report.³

THE ECONOMIC ENVIRONMENT

The present patterns of land use (Fig. 3) have resulted from a process of land exploitation which has been going on for more than 400 years. This process is conditioned by the traditional Luso-Brazilian attitude toward capital investment: for reasons that are rooted not only far back in the history of the Portuguese people but also in the experience of four centuries in the New World, a person who risks his capital in an economic venture seeks quick returns, and when conditions do not permit quick returns the investment is usually withdrawn.⁴ The idea of long-term investment for the purpose of increasing long-term profits, which is the dominant attitude in the Anglo-American world, is appearing in Brazil, but it is appearing slowly. The amount of new capital available for investment is small for three reasons: 1) the minority of wealthy people prefer to use surplus funds for non-productive purposes, and over the four centuries the resource base has provided large speculative profits often enough so that the wealthy minority does not need to worry about long-term profits; 2) a vast aggregate of capital in the hands of small operators has been lost in unsuccessful speculative ventures; and 3) the great majority of the Brazilians have no capital beyond such simple tools as the hoe and the machete. In these circumstances there is no incentive to conserve the resource base, or to seek permanence or stability.

The idea of long-term investments is appearing, especially in São Paulo. But it faces one major difficulty. In countries where purchasing power is relatively widespread, reduction of the costs of agricultural or industrial products through additional capital investment is reflected in a reduction of the prices and in a widening of the markets. But in Brazil where there are a few very wealthy people and many very poor people a reduction of prices does not result in an increased market. There is so wide a gap between the well-to-do people and the very poor people that price-reductions can scarcely be great enough to reach any large number of new purchasers. As a result new capital investment leads to price increases, and the gap between rich and poor is increased by inflation.

Agricultural enterprise in Northeast Brazil must be interpreted in the light of

³ Preston E. James, *op. cit.*

⁴ Report of the Joint Brasil-United States Technical Commission, U.S. Department of State Publication No. 3487, Washington, D. C., 1949.

these economic facts. From time to time and from place to place where opportunities for speculative gain appear, the crop which for the moment is most profitable is planted to the exclusion of everything else and without regard to the preservation of the soil. Most of the time and in most places where no spectacular profits can be forecast, the owners of the land fall back on one basic form of rural land use which, over the years, offers the largest returns for capital invested—the production of beef cattle. The large landowners are traditionally pastoralists, and if their properties are large enough they have been able to maintain a standard of living which seems to them to be adequate. But there are millions of rural people who own no land and have nothing at all to invest except physical effort. These are the tenant farmers, the itinerant laborers, whose drifting back and forth from country to city and from one part of Brazil's vast territory to another is a phenomenon of enormous proportions, only dimly revealed by inadequate statistics. Over large areas in the Northeast, where pastoral land use is the only interest of the landowners, the landless tenants, or *moradores* carry on a shifting agriculture based on maize, beans, manioc, and cotton. The agriculture is promoted by the landowners because it provides them with pasturage where little or none would otherwise be available: it is the only means of survival for a majority of the people.

Two Rural Economic Systems

With the quick-profit motive as a general background, it is helpful to think of two economic systems operating simultaneously throughout rural parts of the Northeast. Actually, these two systems have been in operation during the four centuries that the region has been occupied by people of Portuguese and African descent. One system is organized around the basic pastoral use of the land and involves a majority of the inhabitants of the region; associated with the pastoral economy are the tenant farmers from whose efforts originate certain commercial products as well as subsistence products. The other system involves exclusive attention to certain commercial crops which are marketed outside of the region. The interpretation of the significance of the diverse features of the physical and biotic environment differs in each of these systems. For example, if we are to attempt to identify the marginal producers, we must do this separately for each system. The present map of land use (Fig. 3) is the result of the interaction of these systems over four centuries.

THE PASTORAL ECONOMY

Even at the height of the "sugar period" (ca. 1532 to 1700) when the Northeast was the world's first example of an enormously profitable plantation system with slave labor, the largest area was devoted to the pastoral economy, and the pastoral landlords shared in wealth and prestige with the sugar planters.⁵ Enormous areas, not only in the Zone of the Caatingas, but also in the Zone of the Mata, came under individual ownership. One such estate included most of the state of Sergipe and

⁵ Pedro Calmon, *História da Casa da Torre*. Rio de Janeiro, 1939.



FIG. 4. A new clearing in caatinga: the piles of brush have just been burned and the land is clean cleared. Photo taken in March 1950 on the top of the Borborema in eastern Pernambuco.

a large part of Northern Bahia. At the present time this pastoral tradition continues; the greater part of the region is divided into vast estates; the landowners are primarily interested in cattle and goats and only to a secondary degree in agriculture.

Tenant Agriculture

But neither the mata nor the caatingas are natural pasture lands. Where the Mata has been cleared grass pastures can be planted and in some places maintained. On the deeply leached and eluviated soils of the Taboleiros of the Zone of the Mata (Fig. 2) the grass is so poor in calcium that cattle grazing on it develop bone deformities; but elsewhere in the Zone of the Mata pastures can be developed with a higher animal capacity than in most other parts of the region. There is no grass in the Zone of the Caatingas, but grass can be planted and used for a few years after the caatinga has been cleared. So it is that agriculture is an essential part of the pastoral system.

The tenant farmer lives in extreme poverty and uncertainty. His occupation of any piece of land is temporary, his home simple, his possessions few. Movement to a new location presents no problem, nor does it involve new experiences, for he has never known a home that was permanent. He and his numerous sons and daughters travel freely over the vast expanse of the region, and without reluctance

seek reported sources of economic gain in distant parts of Brazil. From Ceará came most of the workers who gathered rubber in the Amazon before 1910; from all parts of the Northeast come the unskilled workers who plant cotton and coffee in parts of São Paulo state or who build the modern edifices of São Paulo and Rio de Janeiro.

In the Northeast, the pastoral landlord welcomes the tenant farmer. In the Zone of the Caatingas, the tenant clears away the scrubby trees and at the end of the dry season he burns the tangle of branches and dead leaves. On the completely cleared opening, protected by a brush fence (Figs. 4 and 5), he plants his crops all mixed together on the same land, seeking, in his own way, to secure maximum returns for his efforts in a short time (Fig. 6). He plants maize, beans, manioc, and cotton. He expects to have a small surplus, especially cotton, that he can sell in exchange for *rapadura* (sugar cake), *carne seca* (dried beef), and rice. He plants his crops on any area he can find: he cannot use bare rock, or places mantled with coarse, bouldery gravel; but where his crops can take root, no place is too steep or too dry. In better places, where he can expect better yields, he must share half and half with the owner; where the land is so poor that only very low yields can be expected, the tenant takes all he can harvest. In years of drought he harvests nothing,

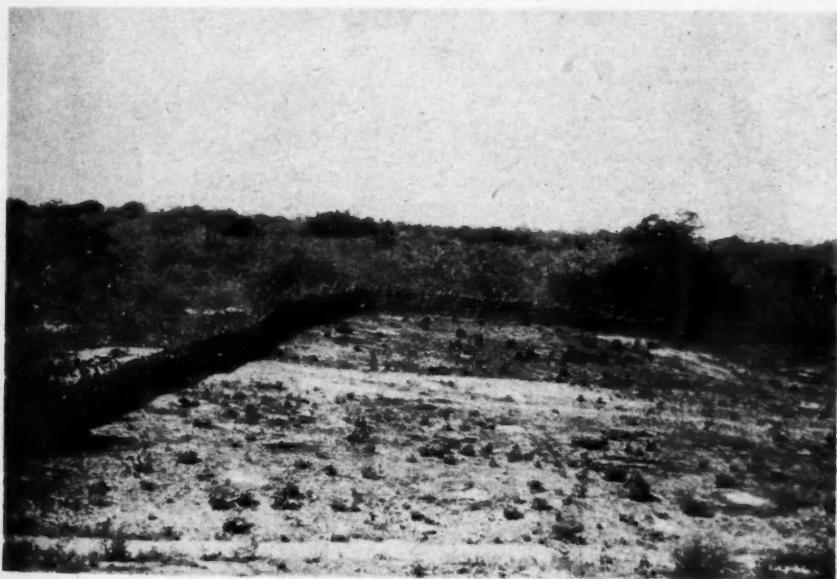


FIG. 5. A new clearing in the caatinga: in the foreground the completely cleared land ready for the planting of crops; in the background, beyond the typical brush fence, is second-growth caatinga in the rainy season. Photo taken in February 1950 on the top of the Borborema in eastern Paraíba.

but the landlord is not the loser. After a few years, usually not more than two or three, yields begin to decline; the tenant then plants grass in the better places, or a kind of spineless cactus known as *palma*⁶ in the drier places. He moves away and the landowners moves in his cattle or goats. The newly created pasture is heavily grazed for a few years as the scrubby trees again invade and reclaim the land (Fig. 7).

In four hundred years no part of the Northeast has been spared. The original vegetation has been cleared, perhaps several times. Under the intense tropical sunshine, clean clearing has the effect of killing the bacteria which have the normal function of creating humus.⁷ The result is that the soil contains less and less organic matter. In those places where population is relatively dense (Fig. 8), the interval between clearing becomes shorter and shorter, and the soil on which the whole system rests is gradually destroyed. The poverty of the tenant farmers and also of the smaller landlords becomes greater, but at a rate which is imperceptible to an illiterate people.

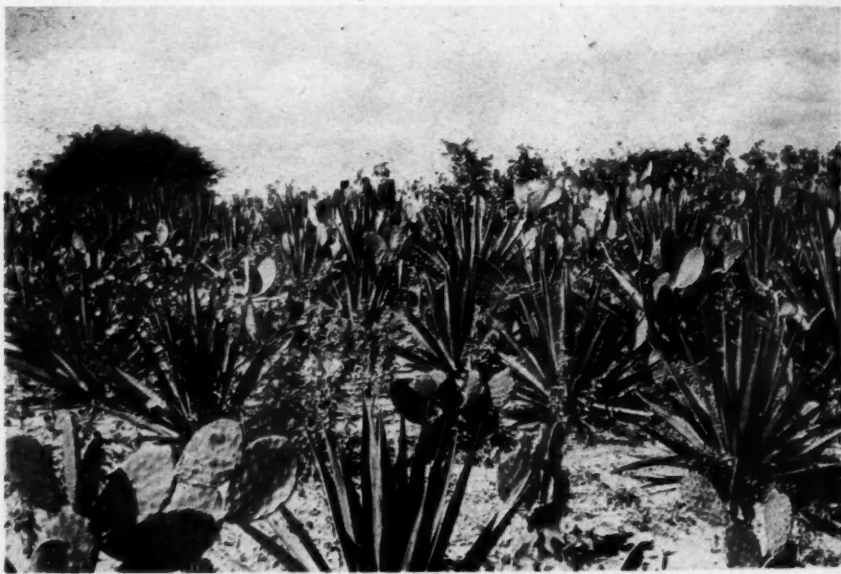


FIG. 6. Cropland in the third year in the drier part of eastern paraíba. In this small area the spineless cactus known as *palma* is a feed crop. Old cotton plants are mixed with young *agave* (sisal). At another time of the year maize and beans also occupy the same land. Photo taken in March, 1950.

⁶ *Palma* was introduced from South Africa in 1934, and, since it is 93% water, it provides important feed to mix with cotton-seed cake in the dry season.

⁷ J. G. Duque. *Solo e Agua no polígono das Sêcas*. Dep'to. Nacional de Obras contra as Sêcas, Publ. No. 149, Ser. 1 A, Fortaleza, 1951.



FIG. 7. An old clearing, now planted with pasture grass, and in process of being invaded by the caatinga. March, 1950.

On the map of land use (Fig. 3), two categories cover the larger part of the Northeast, and both are products of this pastoral system.⁸ These are the areas shown as land rotation and those shown as unimproved pasture. The two are very similar in that the larger part of the total area is used for pasture (Fig. 9),⁹ a considerable area is resting under an uncontrolled cover of scrub, and a part of the area is used on a system of land rotation for such crops as maize, beans, manioc, and cotton (Figs. 10, 11, 12, and 13). In some places instead of cotton, sugar cane is grown for local use or castor beans are grown as a money crop (Figs. 14 and 15). In the area indicated as unimproved pasture (Fig. 3), the proportion of land used for crops is small; in the area included in land rotation, crops occupy a larger part of the land. Although the distinction is one of degree, the boundary between these

⁸ This map was prepared partly on the basis of direct observation in the field as described in the first part of this report (*Annals*, June 1952), and partly from the plotting of statistical data subsequent to the fieldwork. The categories are those of the World Land Use Survey as adopted by the Commission of the International Geographic Union. This map constitutes a "pilot study" of the methods and effectiveness of land use mapping on 1/1,000,000.

⁹ The dot maps of cattle, and of the areas occupied by certain crops. (Figs. 9-15, 20, 21) were based on figures for 1948 by *Municípios* published in the *Revista Brasileira dos Municípios*. The dots were placed within *municípios* on the basis of direct field observation and the study of air photographs. In the preparation of these maps the author was assisted by William G. Byron.

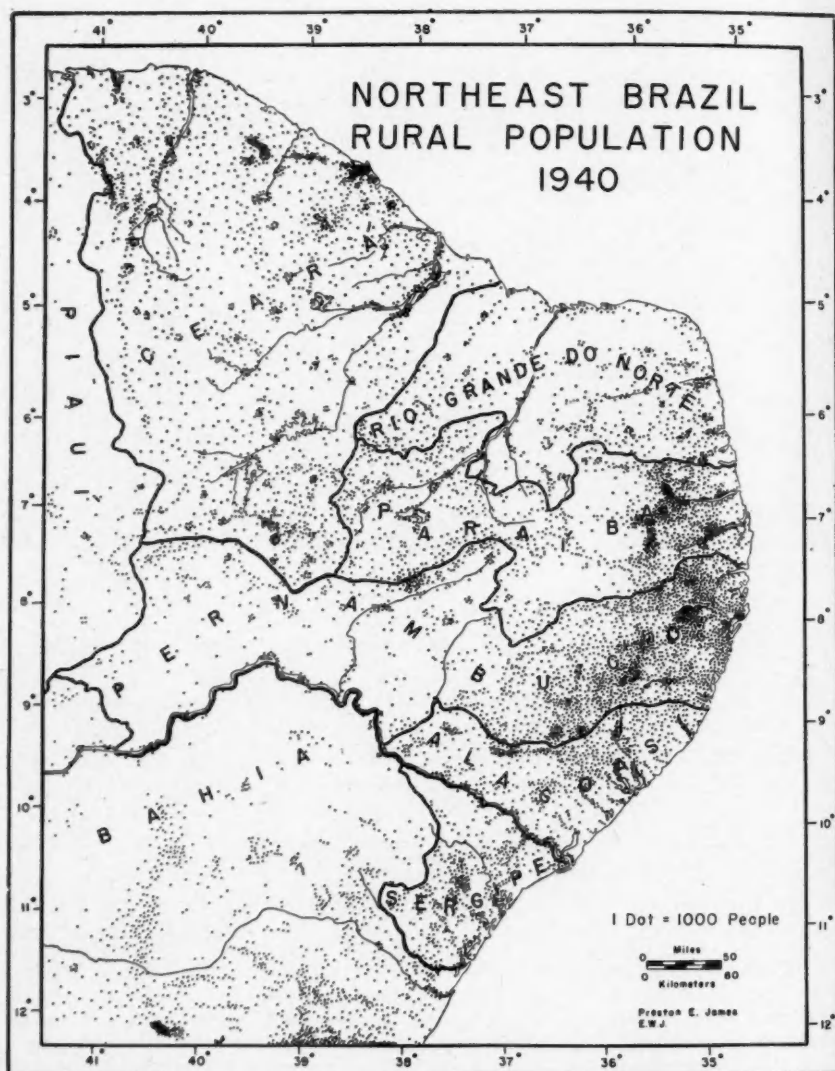


FIG. 8. Rural Population of the Northeast, 1940.

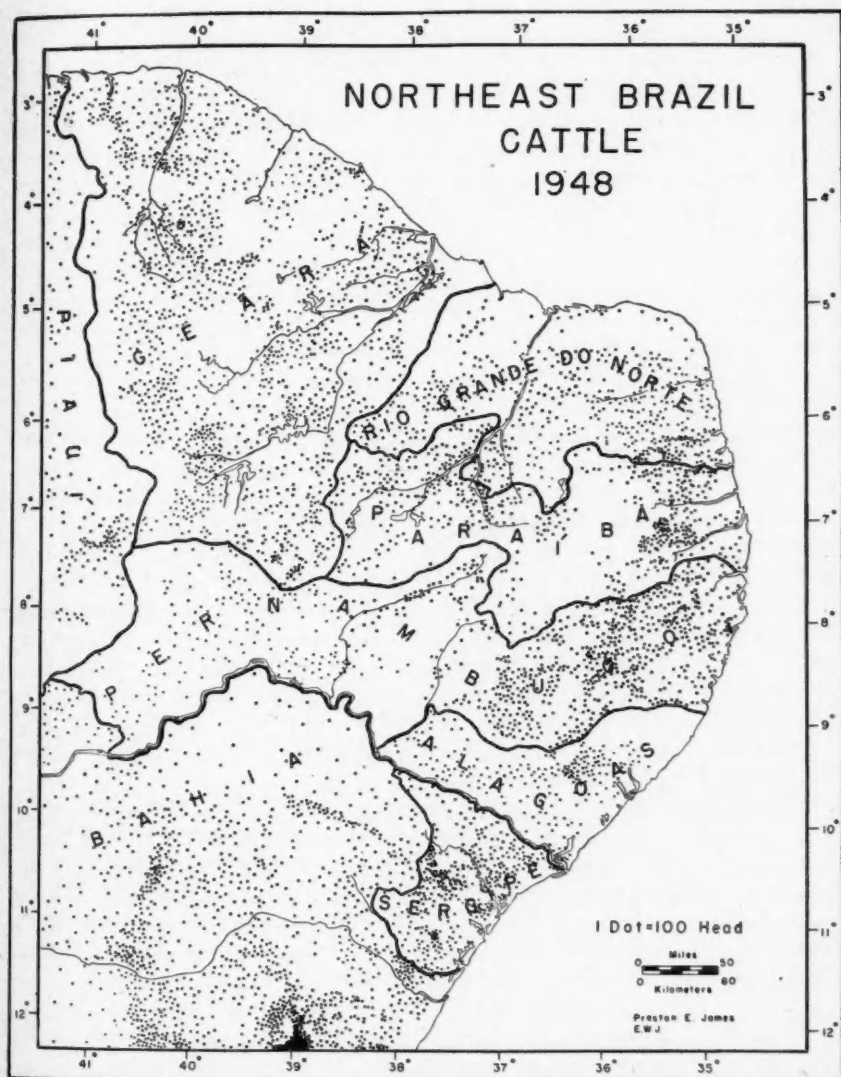


FIG. 9. Distribution of cattle, 1948.

two categories is usually sharp. Crops are concentrated on hilly areas, whereas the broad plains, outside of the alluvial valleys, are mostly used for pasture (Fig. 2).

Areas of Crop Concentration Associated with the Pastoral System

There are certain areas of small extent but great economic and social importance in the Northeast where the land is used wholly for crops, but which are more or less intimately associated with the pastoral system. On the map of land use these are represented by *vazante* agriculture, *Pé da Serra* agriculture, the plantations of Carnauba Palms, and certain areas devoted to sugar cane.

The most intensive use of the land in any part of the rural Northeast is to be found on those areas which are alternately flooded and exposed by the natural rise and fall of the streams. Such periodically flooded areas are known as *vazantes*, and the intensive horticulture practised on them is called *vazante agriculture*. The most important areas of this sort are along the valleys of the Açu and Jaguaribe in Ceará, and of the Acaraú-Piranhas in Rio Grande do Norte. These valleys have very low gradients, and only along the natural levees close to the winding streams are there lands suited to agriculture. The drainage of the back marshes, considering the very low gradient of the rivers, presents insuperable problems. Furthermore, along these rivers the land properties have been subdivided by inheritance into long narrow bands at right angles to the rivers. An individual property may be several miles long and only a few yards wide. Only the part near the river is used for *vazante* agriculture: the part back from the river is used for pasture.

Vazante agriculture is also practised around the numerous reservoirs or *açudes*, built mostly during the past 50 years by the government as a measure of protection against the droughts. Because there is so little flat land near the water level, there is very little irrigation in the usual sense of the word (Fig. 16). A band of *vazante* agriculture follows the margins of each *açude*, narrow or wide as determined by the slope of the banks. Around these public *açudes* the land has been divided into small lots and made available to farmers.

The small amount of *vazante* agriculture along the great São Francisco River may seem surprising. This river, sometimes mistakenly called the Nile of Brazil, is, in fact, no Nile. Its banks between Juazeiro and the Paulo Afonso Falls are steep, but not high (Fig. 17). Bordering the river where irrigation works might make water available, there is very little land suitable for agriculture. Below Paulo Afonso the river enters a canyon. *Vazante* agriculture could be practised only in very narrow bands along the banks, or on sandbars which appear in the river bed at low water. The São Francisco River in this part of the Northeast flows through thinly peopled country, and constitutes a barrier rather than an axis of settlement (Fig. 8). To provide transportation to a central market for the products of long narrow ribbons of *vazante* agriculture would be difficult, especially as the river between Juazeiro and Marechal Floriano is not navigable. Therefore only a few miniature spots of agriculture have appeared around such towns as Cabrobó, Jatinã, and Petrolândia.

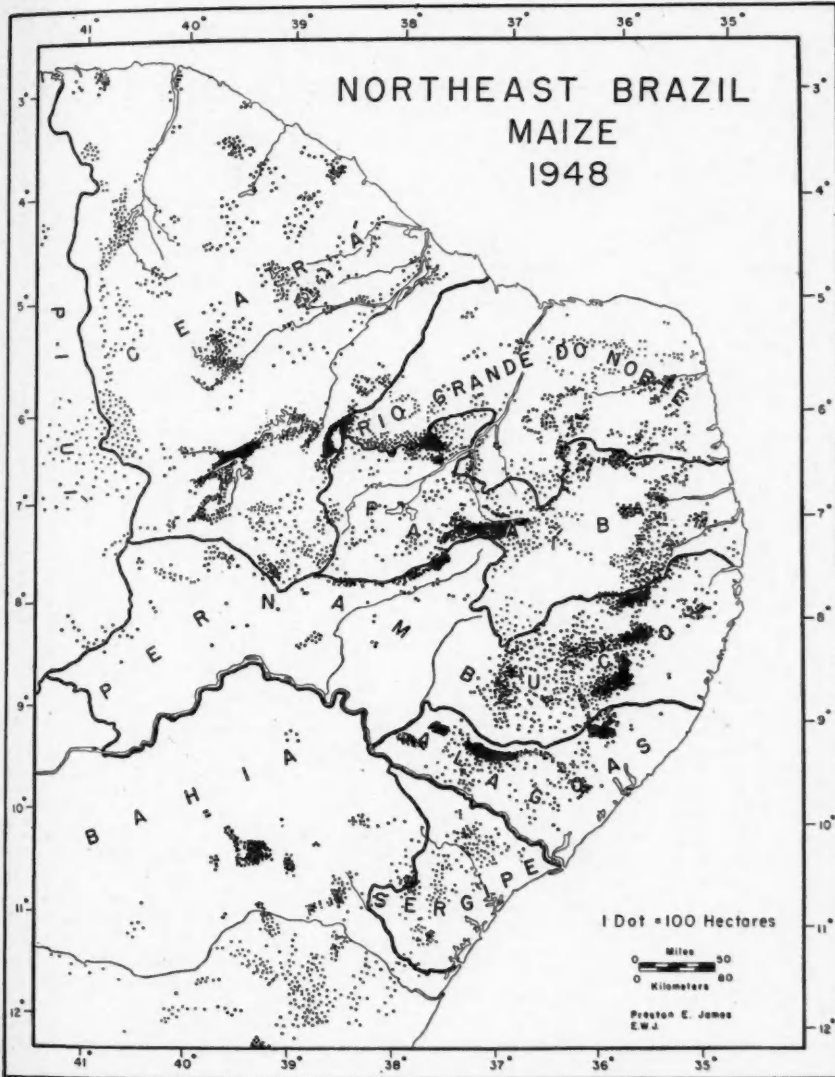


FIG. 10. Distribution of maize, 1948.

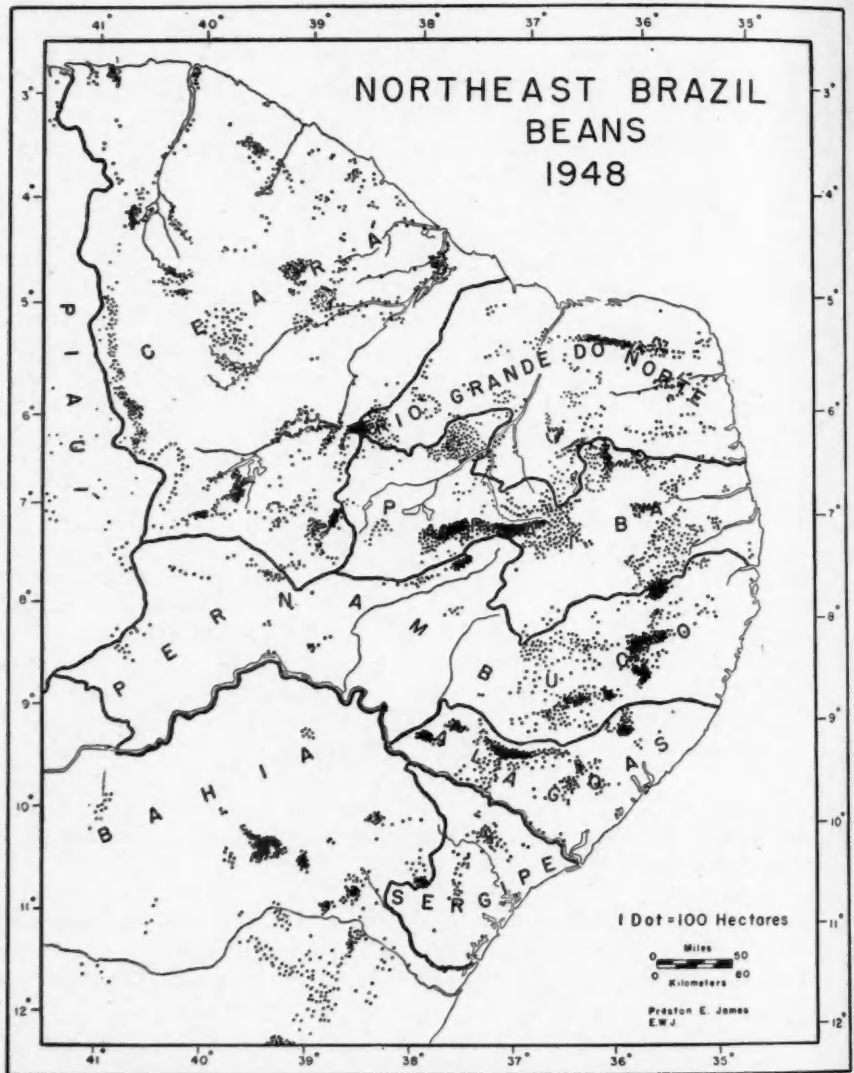


FIG. 11. Distribution of beans, 1948.

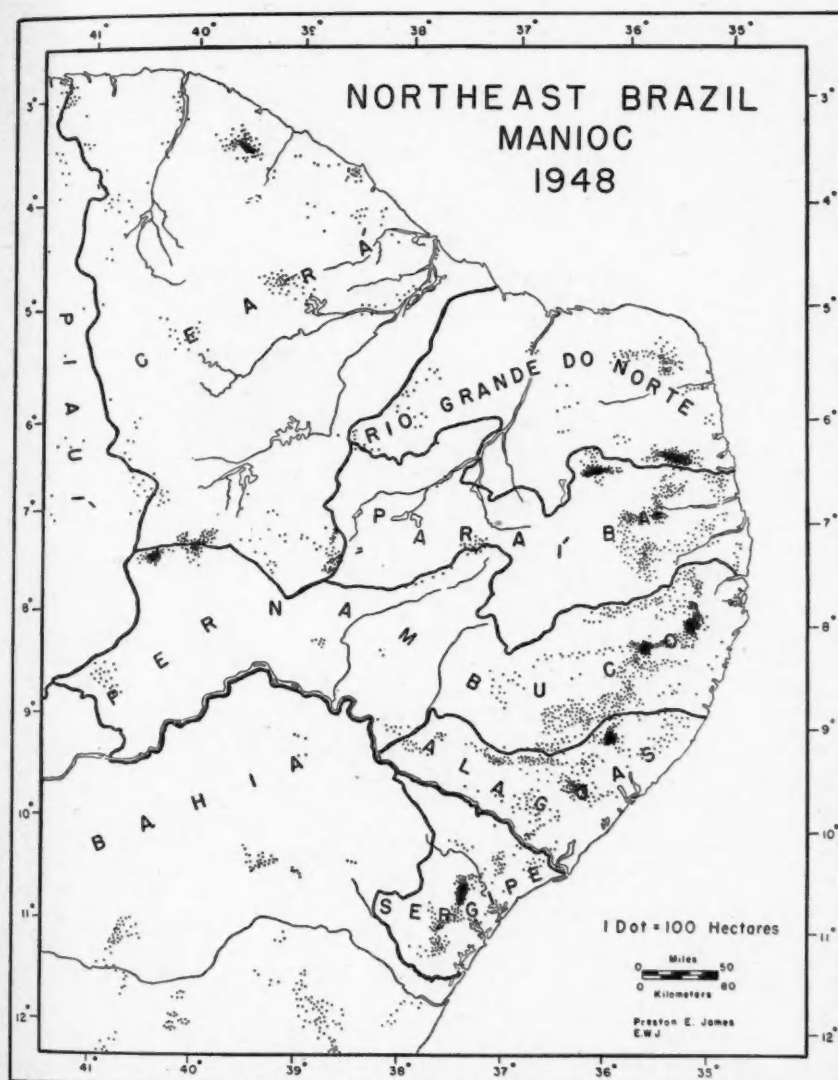


FIG. 12. Distribution of manioc, 1948.

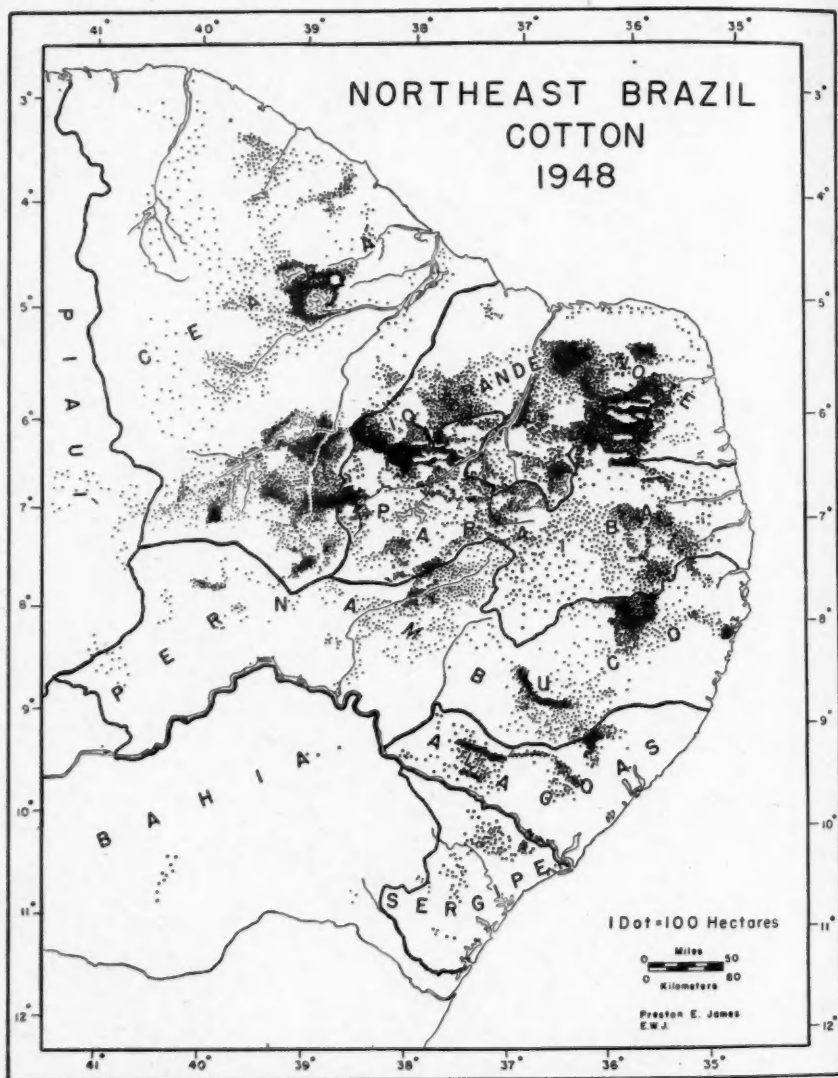


FIG. 13. Distribution of cotton, 1948.

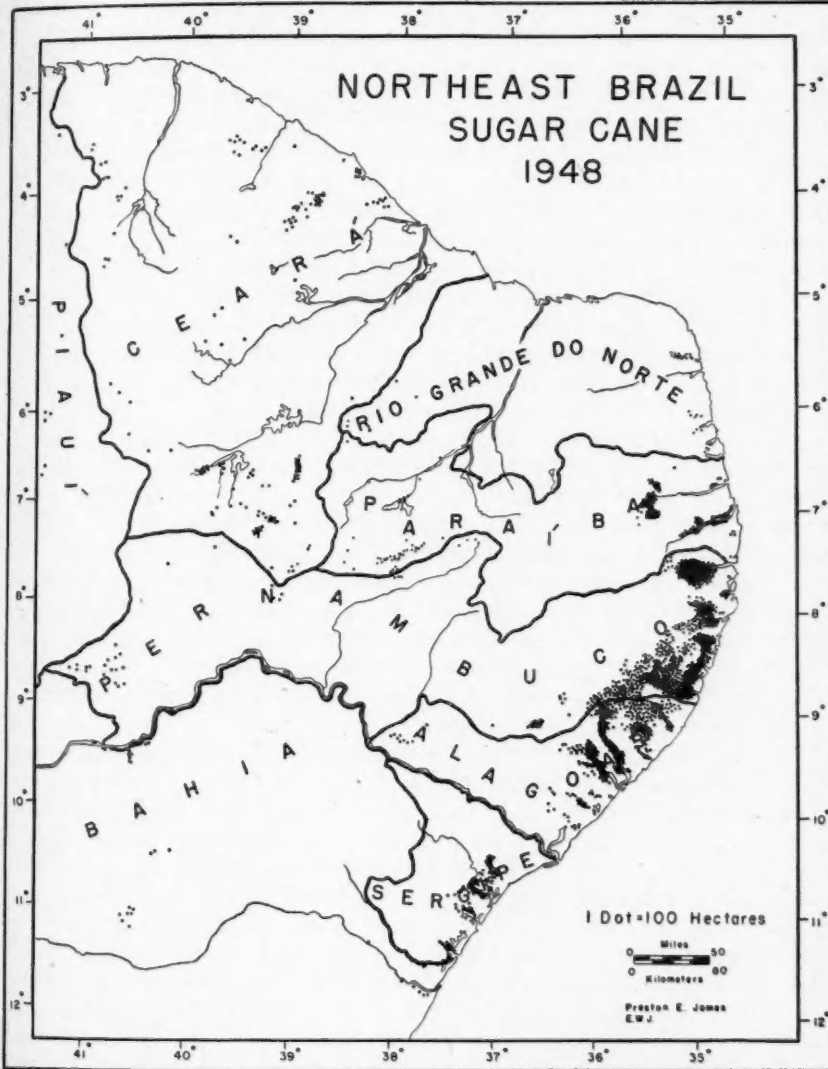


FIG. 14. Distribution of sugar cane, 1948.

Another kind of permanent agriculture is the kind known as *Pé da Serra*, or foot of the serra. It is developed on the colluvial bases around clusters of hills in the area of the broad plains with erosion remnants (Figs. 2 and 3). Showers occur even in dry years in the hilly areas, and water is available around the base. There are certain spots in Bahia where communities of farmers have produced manioc on the same land for more than forty years without rotation.

The plantations of Carnauba palms (Fig. 3) are also closely related to the pastoral economy of the Northeast. This is one of the most highly profitable and stable relationships in the whole region, and the form of land use which is least destructive of the land base. It is concentrated in the valleys of north-flowing rivers of Rio Grande do Norte, Ceará, and Piauí, and at elevations below 300 meters.

Along the natural levees young trees are planted, and for the first four years are interplanted with maize, beans, and manioc. Thereafter, the mature palms are interplanted with pasture grass, which does very well indeed with the shade provided by the trees. Grazing does not harm the palms, which continue productive, much to the benefit of the landowners, for as long as a hundred years.

The fourth kind of agricultural concentration in the pastoral area is that devoted to sugar cane. It does not include, however, the cane plantations which sell the product outside of the Northeast. On some of the islands of mata which occupy the rainier spots of the Zone of the Caatingas, the original forest has been cleared away and the steep, hilly land planted with cane. Yields are very low, and the juice is extracted in small *engenhos* usually with capacities of less than 100 tons of cane per day. The product is *rapadura*, a sugar cake widely eaten throughout the region. The most profitable and stable cane plantations are those which can be irrigated along the upper Jaguaribe near Crato, on the eastern side of the Chapada de Araripe. Here abundant water emerging in springs from under the sandstone cap supports an oasis of permanent agriculture.

All these kinds of agriculture are intimately related to the pastoral system. Without the tenant farmer to clear the brush or forest and leave planted pasture in the abandoned clearings, the pastoral system could scarcely survive. In parts of the Northeast where cotton is grown by the tenant farmers, cotton seed cake is now a major item of feed for the cattle; in fact, without this market for the cake, cotton might even disappear from the Northeast, for the fiber can be produced more cheaply in São Paulo state. The farmers of the vazante and Pé da Serra areas find additional employment and markets for their products on the estates of the pastoralists. Carnauba provides a steady and substantial additional form of income for the large landowners, and a form of land use which is not destructive. Meanwhile there is a steady demand for freshly killed cattle in the cities of the region. Animals are driven on the hoof to such market towns on the margin of the Zone of the Mata as Campina Grande, Arcoverde, and Feira de Sant' Ana (Fig. 1). In areas too dry and stony for much agriculture, goats rather than cattle are produced; and goat skins from this region bring good prices on the international market. When all else fails the cattle and goats bring a steady income for a relatively small investment.

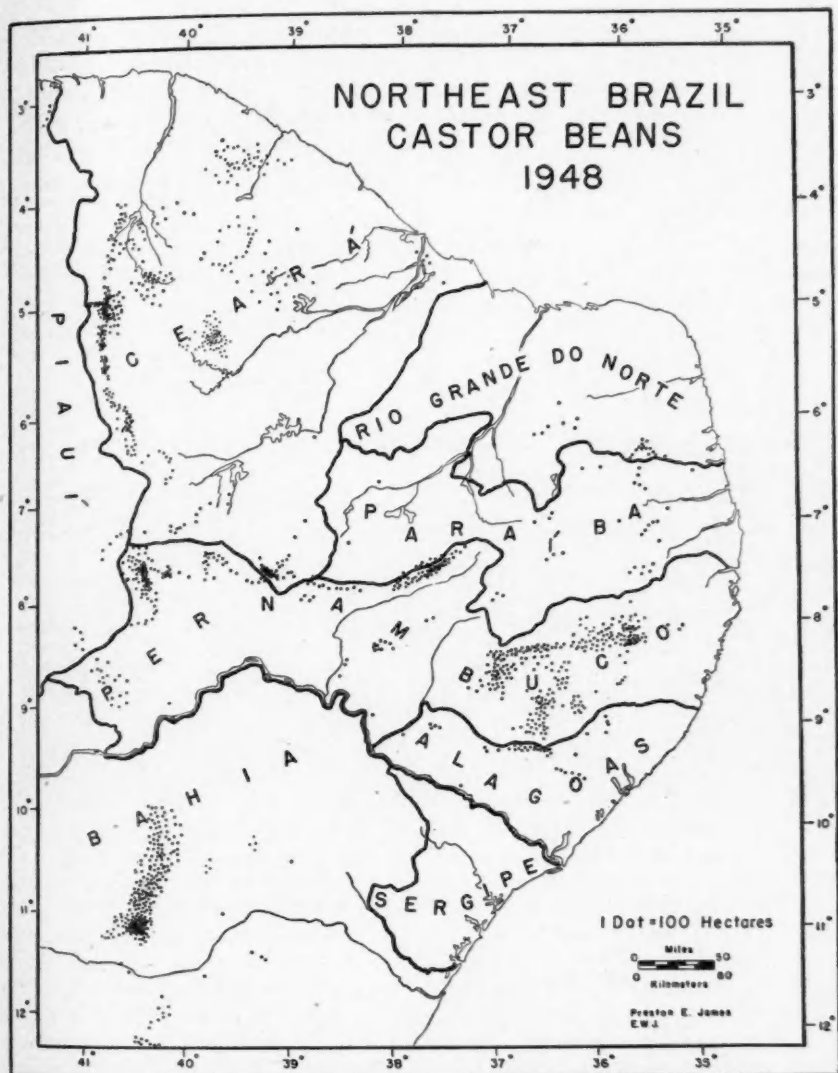


FIG. 15. Distribution of castor beans, 1948.

THE COMMERCIAL ECONOMY

Superimposed on the pastoral economy, both economically and geographically, is the commercial economy. This includes those agricultural products which find so ready a market outside of the region that the returns on investments are large and rapid. In places where this kind of economy can be practised, the land is wholly devoted to its products. At present the products which are so profitable that they are cultivated without regard to the pastoral interests are sugar cane, rice, coffee, coconuts and agave.



FIG. 16. An açude (reservoir) near Caicó in the Acaraú-Piranhas Valley of Rio Grande do Norte (Fig. 1). Vazante agriculture around the margins of the açude where the drop of water level has exposed moist land. At the head of the inlet in the middle distance, center, is a crop of rice. Very little total area is made available for crops by this engineering work.

Sugar Cane

There is a distinction between sugar cane grown around the *usinas*, or large modern mills, and that grown around the *engenhos*, or more simple small-scale mills. The *usinas* produce sugar for sale throughout Brazil; the *engenhos* produce rapadura mostly for the regional market. The part of the Northeast which produces sugar for export is the wetter part of Pernambuco, Alagoas, and Sergipe, in the Zone of the Mata (compare Figs. 2, 3, and 14); the same area which has been producing sugar cane since 1532. The other big producing area in Brazil, the Recôncavo of Bahia, is just south of the limits of the region.

The commercial sugar cane industry of the Northeast is by no means secure. The big speculative profits were made before 1700, in Brazil's first great era of prosperity. For a long time the cane plantations of the Northeast were decadent, as large numbers of the original planters removed their capital to more profitable ventures such as gold mining in Minas Gerais, or coffee planting in São Paulo, or city-building in Rio de Janeiro. But as the Brazilian cities grew, and more and more city people wanted *cafezinhos*—the small cup of black coffee half filled with sugar—the sugar cane plantations of the Northeast again offered opportunities for quick returns on investments. Much new sugar machinery was purchased during the 1920's, and relatively large-scale *usinas* were set up.

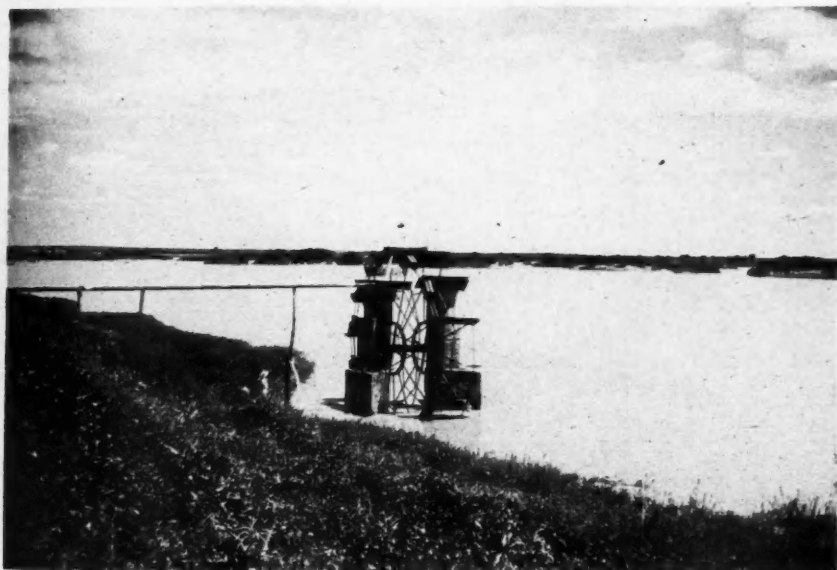


FIG. 17. Waterwheel to raise water to the immediate bank of the São Francisco River to support a small area of *vazante* agriculture near Jatinã in Pernambuco (Fig. 1). The river is not far below its high water stage. It never floods over the broad plains beyond its immediate channel. No large area is available for irrigation, even if electric pumps were used. Photo taken in April, 1950.

Yet a careful study of the situation shows that most of the sugar cane plantations of the Northeast are economically submarginal, even in terms of the national economy. The *Instituto Nacional de Açúcar e Alcool*, the agency of the federal government charged with the supervision and control of the entire national sugar industry, protects the cane planters of the Northeast against the competition of more efficient, lower cost producers from other states, especially those of São Paulo. The Instituto levies a tax on each planter based on his costs of production: the Paulista planter pays 13 per cent of his costs, but the planter from Pernambuco pays only

6 per cent. The purpose of this arrangement is to maintain the sugar plantations of the Northeast, for it is felt that if the process of competition were to eliminate the sugar planters from most parts of the Northeast this would amount to a social disaster.

The soils and surfaces of the Northeast are not well suited to cane planting. Most of the land is hilly, and something like 60 per cent of the cane grown in the Northeast is on slopes of between 12 and 25 degrees (Fig. 18). The volume of soil erosion over the centuries has been tremendous, and the yield per hectare is at



FIG. 18. Sugar cane on steep slopes in the midst of the chief cane area of Pernambuco. The town in the distance is built around the *usina* of Catende, the largest cane planation of the Northeast. Note cane on steep slopes as in immediate foreground, or on the opposite side of the valley. Valley bottom is in grass, mostly not used at all or occasionally grazed. Photo in March, 1950.

present only about 30 tons, as compared with 120 tons in Cuba. The hilly terrain prohibits the use of machinery: the cane fields are cultivated and the cane is harvested by hand; the cane is transported on donkey back or in ox carts to narrow gauge railroads in the valleys.

The picture of sugar planting in the Northeast, however, would be incomplete without mention of the superior plantations, for there are a few of them. In the small areas of alluvial floodplain soils, especially in Paraíba, Pernambuco, and Alagoas, there are a few efficient large-scale operations, notably that of the Leão Brothers in Alagoas near Maceió. On valley bottom lands, considerable investment must

be made in drainage and diking against floods (Fig. 19). But the good alluvial lands respond well to fertilizer and to machine cultivation. Yields per hectare are as much as 80 to 100 tons. If competition were unrestricted, these few valley-bottom planters could probably continue to serve the national market, sending their sugar northward rather than south.

Irrigated Rice

In addition to sugar cane, which is the traditional commercial product of the Northeast, there are several other products, occupying only small areas on the land use map (Fig. 3). The first of these is the irrigated rice. Rice is the most important staple food of the Brazilians, and in other parts of the country it replaces cotton as the chief money crop of the tenant farmers. In the Northeast little land is devoted to rice. In the competition for the hilly lands of the Zone of the Caatingas where somewhat heavier rainfall makes sugar cane profitable, the income from rapadura is greater than could be realized from rice or other foods. Therefore, the Northeast must import its rice.

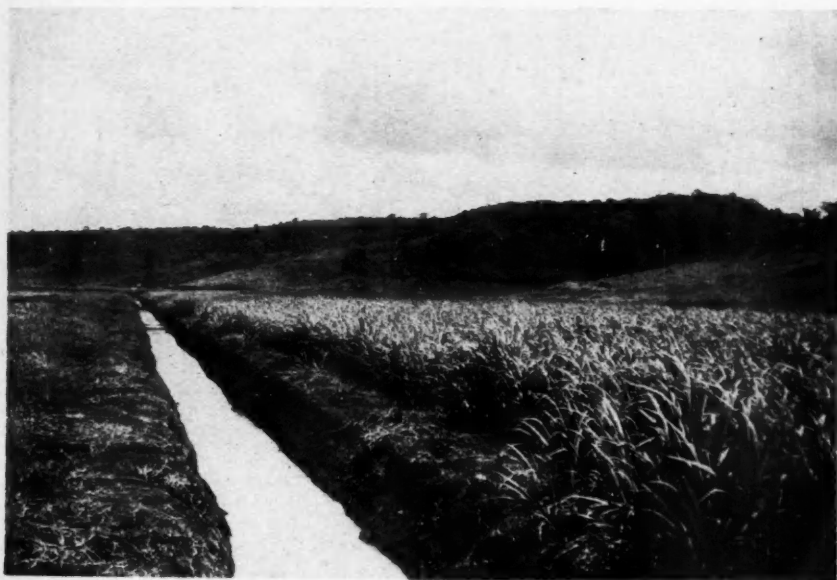


FIG. 19. Modern cane planation of the Leão Bros. in one of the coastal valleys of Alagoas. Drainage ditches control floods; the alluvial soils, properly managed, give high yields. Valley sides in woods or pasture. Photo in April, 1950.

There is some rice production, however, in a few favored spots (Fig. 20). On a tributary of the Jaguaribe in Ceará there is a small area of concentrated rice production. The most important area, however, is along the lower São Francisco,

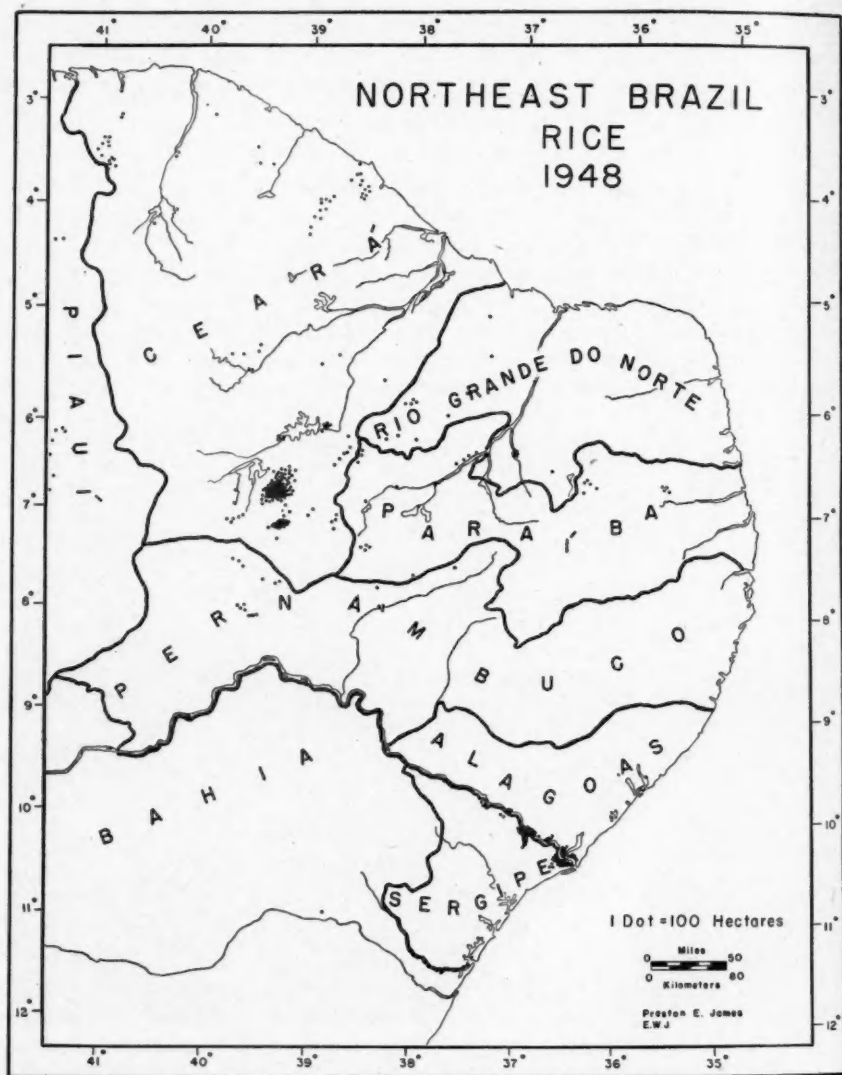


FIG. 20. Distribution of rice, 1948.

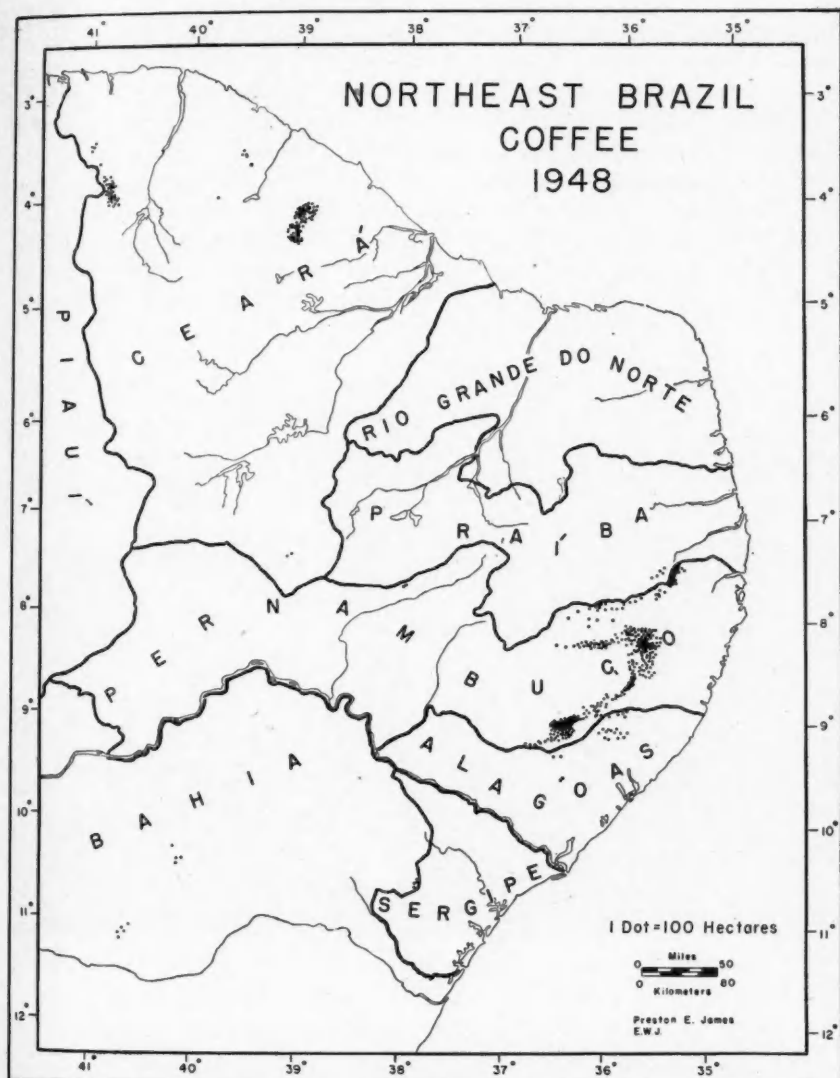


FIG. 21. Distribution of coffee, 1948.

notably along the southern side of the river near its mouth in Sergipe. Much of this rice is sent out of the region from the port of Penedo. The small size of the flood plain area means that there is little opportunity for expansion.

Coffee and Coconuts

Coffee is produced in the Northeast. Although it is consumed chiefly in local markets and in the Amazon region, and none of it enters foreign commerce, it is sufficiently profitable completely to dominate the few areas where it is grown (Figs. 3 and 21). Here, as elsewhere in Brazil it is grown without shade: the land is completely cleared and as many coffee trees as possible are crowded together, something like 300 trees per hectare. Shade would lengthen the life of a plantation and do much to reduce the destruction of soil and bacteria, but this would decrease the speed of the returns of investment.



FIG. 22. Agave is the only crop on all kinds of land near Campina Grande in Paraíba. On steep slopes this leads to rapid new soil erosion. Photo in March, 1950.

Coconut plantations are found in ideal spots along the coast, mostly near the towns. Excellent soil and drainage conditions for coconuts are found along most of the coast of the Northeast, and if markets and other facilities were organized, there might be a very large expansion. The income from coconuts, however, has not been sufficient to attract a large amount of new investment. Most of the Northeast coast is empty except for the villages of the jangada fishermen.

Agave

There are certain fiber plants, other than cotton, which grow well in Northeast Brazil. Caroá is collected in the caatinga and the fiber extracted in small portable mills.¹⁰ No permanent use of the land results, although the export of this fiber and its local use for hammocks and other products has been highly profitable. Agave is another matter. This plant, from which sisal and henequen are derived, became profitable only after World War II. The Mexican production of sisal had dropped,



FIG. 23. The edge of the Borborema near Triunfo, state of Pernambuco. This was one of the islands of mata in the midst of the Zone of the Caatingas, now being cleared for sugar cane. Photo in March, 1950.

yet the market for binder twine and other coarse cordage was increasing. Brazil, among a number of other countries, has entered the sisal market. The agave area is concentrated in the state of Paraíba near Campina Grande, where large areas are devoted to this plant (Fig. 3). Soil erosion where agave has been planted in the Zone of the Mata on steep slopes is already tremendous (Fig. 22). But where it is grown in the Zone of the Caatingas and on land which is not too steep, there is no reason why it should be especially destructive.

¹⁰ Ney Strauch, "As Usinas de Caroá," *Revista Brasileira de Geografia*, XI (1949): 448-449.

THE LAND USE PATTERN AND THE PROBLEM OF POVERTY

These various uses of the land for agriculture and for the grazing of animals are, with few exceptions, destructive of the resource base. The steady increase of population, which has gone on in spite of a high deathrate and continued emigration to other parts of Brazil, notably Rio de Janeiro and São Paulo, has placed a steadily increasing burden on the land at the same time that the productivity of the land has been steadily decreasing. The decrease of productivity has been due to the clearing of slopes that are too steep (Fig. 23), and to the shortening of the interval of recuperation in the system of land rotation. In the better lands of Paraíba, Rio Grande do Norte, and Ceará where cotton is important as a part of the rotation system, the periods of regeneration could be as short as 12 to 15 years if leguminous trees were planted at the end of the period of pasture.¹¹ But this is not done. When the owner receives a piece of land formerly cropped and now provided with seeded grass or palma, he permits his cattle to graze on the new pasture in such numbers that the feed is quickly used up. He makes no effort to control the encroachment of the second growth of brush, and finally abandons it to the caatinga when his animals can find no more feed in it. The period of regeneration in some of the more densely populated areas is as little as 7 to 10 years, which is not enough to restore bacterial action and humus on land where these essentials had been destroyed.

One of the chief errors, it seems, has been the application of European methods of clean clearing to a tropical area, which should at all times remain shaded and unkempt. The clearing of the original forest on the hilly lands increases the run-off in times of heavy rain, so that the streams draining from these higher areas are now subject to disastrous floods of short duration separated by long periods when they carry no surface water at all. With the organic matter destroyed not only on the hills, but also on the broad plains, the water holding capacity of the soil has been lost. The water table has dropped, and has become salty. The droughts have become calamities: but man-made calamities, resulting from the destruction of the resource base by a people who did not know what they were doing to their own economy.

¹¹ J. G. Duque, *op cit.*

PHYSIOLOGICAL CLIMATOLOGY AS A FIELD OF STUDY

DOUGLAS H. K. LEE

Johns Hopkins University

ORIENTATION

"All scientific work constitutes a set of operations which comprise points on a continuum. From this common pool each group of scientists . . . selects for study the events or aspects of events which interest it."

IF Kantor's¹ definition of a "field" be accepted, then we may truly say that such a field exists for the study of the effects of climate upon the welfare and activity of man and the higher animals. It has existed, in fact, from Hippocratic times, though with varying degrees of recognition and with varying scientific content. It is perhaps characteristic of our analytical age that the need for a distinctive name is now felt, but, if we bow to this demand, we must do so on terms which leave our operations unfettered. Twentieth century science owes a great deal of its progress to the precise use of words in the definition of unitary processes and quantities; but this precision is philosophically inadmissible and stultifying in practice when applied to the nomenclature of points on a continuum. A name which indicates the general area or focal point of interest, and is short enough for convenient use, should suffice. It is of far less consequence that two people may have somewhat different concepts of the field content, or different ideas as to individual responsibilities for its development, than that any investigator should be discouraged from following his thoughts where they will, even "outside his field."

In practice, the working boundaries of a "field" will be determined more by circumstance than by logic. The nature of the investigators' training, the practical or intellectual drives that bring them together, the prior history of the relevant studies, and even the general cultural pattern in which the workers exist will all have their effect. For such a complex of reasons, the area of studies which is coming to be known as "physiological climatology" most commonly deals with the direct effects of climatic elements and patterns upon the physiological behavior of man and other warm-blooded animals. In conformity with common practice, the term "physiological" here refers only to animals; but the exclusion, not only of all the invertebrates, but of "cold-blooded" vertebrates up to and including reptiles as well, is arbitrary, and can be justified only by the physiologist's preoccupation with the process of homeothermy. There would probably be no indignation if a herpetologist, or even an entomologist, studying the operation of climatic factors upon his animals, were to include himself among the brethren.

¹ J. R. Kantor, "The aim and progress of psychology," *American Scientist*, XXXIV (1946): 251.

Many physiologists continue their interest in processes after they pass into the frankly pathological realm; and climatic physiologists are no exception. To the extent that disease states are set up by the direct effect of climate, or to the extent that disease processes arising from non-climatic causes are modified in form or intensity by climatic conditions, this continuance of interest is legitimate; but there comes a time when the term "medical climatology" is more apt. An even more subtle graduation occurs as the behavior under study passes from the general physiological, through the neurological, to the psychological, and it is a foolish as well as a bold man who would attempt to allocate territory in this shadow land.

It is perhaps in the connotation given to "climatology" that the sharpest departure from common practice is met, since the physiological climatologist is primarily concerned with *effects* of climates, and not with their origins. He is interested in what they do to man and animals, not in how they came into existence. He will display an intelligent interest in their causation, to the extent that his personal equipment permits, but the knowledge is not essential to his operation. It may become necessary, as activities increase and specialize, to distinguish the climatic or environmental physiologist from the physiological climatologist, but a strong need for such a dichotomy is not yet apparent.

NATURE

To obtain a knowledge of the effects of climate upon warm-blooded animals, it is clearly necessary first to have full understanding of the detailed nature of the former, and of the detailed physiology of the latter. From this basis the full range of animal responses, individually and in combination, can be examined in relation to the full range of climatic elements and patterns, and followed through to their final significance for the animals' well-being.

The scope of a very similar study, and the mental attitude involved on the part of the investigator, have been set out elsewhere² in the form of a diagram (Fig. 1). For convenience of discussion and conformity with established disciplines, the environmental components are shown as contributing to five operating groups of factors:

- thermolytic, primarily affecting the loss of heat from the animal to the environment;
- metabolic, primarily affecting the heat production by the animal;
- psychologic, primarily affecting the mental activity of the animal and its orientation to its situation;
- biologic, primarily affecting the influence of other living organisms upon the animal;
- material, primarily affecting the influence of material substances upon the animal.

The last two are, by definition, peripheral to the field of physiological climatology.

² D. H. K. Lee, "Physiology as a guide to combating tropical stress," *New England Journal of Medicine*, CCLXIII (1950): 723-30.

Two things should be clear at this stage of the discussion: first, a thorough knowledge of the whole field is quite outside the scope of one man's mind; second, the essential character of the field is not that of new facts, but of new and integrative understanding. One of the greatest weaknesses of our rapidly expanding scientific knowledge is the inadequacy of integrative concept. This was sharply revealed in the attempted application of scientific knowledge to war-time problems; and that fact is partly responsible for an increased interest in "inter-disciplinary" research. The current interest in physiological climatology is thus both natural and timely.

MODES OF APPROACH

It is no accident that integrative studies have lagged behind. The whole is greater than the sum of its intellectual parts, if only because considerations of

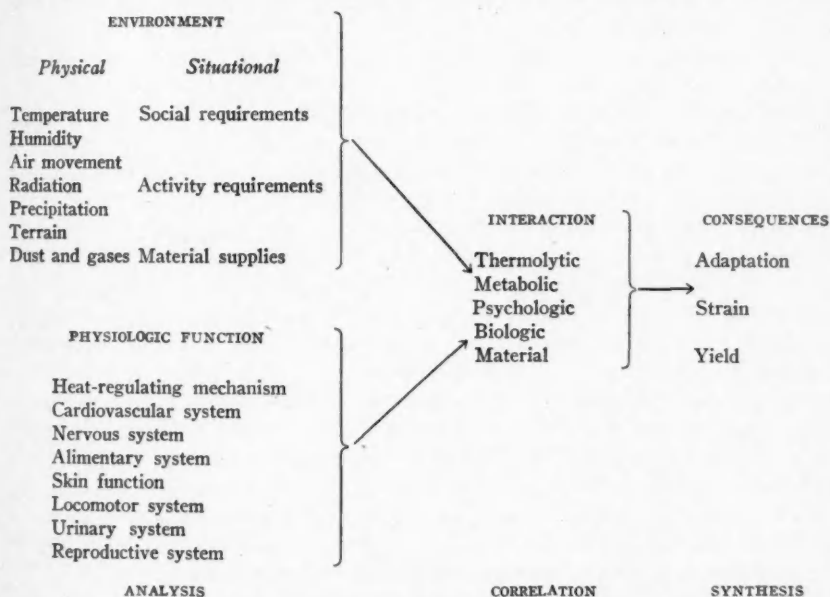


FIG. 1. Phases of Study in Human Climatology

interaction between the parts must be added to considerations of their content. There are few guides for the integrative process and fewer rules. It relies upon what the medical man calls "clinical judgment," and the sociologist calls "empathy." The mind, steeped in the evidence by long and thorough examination of its details, makes felt associations rather than logically defensible deductions, and sets up tentative expressions of relationship. One trained in the rigorous logic of the basic sciences may look askance at this process, fearing the infiltration of mysticism.

It cannot be denied, of course, that there are opportunities for abuse, or that abuse has occurred; but that is true of any tool. Nor can it be denied that it is much harder to guard against abuse of this process than of formal scientific logic; but that is a responsibility to be faced. A clear recognition of the necessity for the method and of its inherent dangers will do much to ensure its healthiness. After all, it is a highly successful mode of procedure in many channels of endeavor pursued by or relied upon by the most rigorous logician, such as crossing a busy street, buying a house, or getting medical advice. The method is supplementary to, and not a substitution for, classical procedures. It is to be used only where necessary, and only after thorough study of the evidence. Above all, it must proceed cautiously and in the light of continuous, careful testing of hypothecations against actual occurrences.

Kantor describes the development of a scientific field as having three stages:

Substance-Property Stage;

Statistical-Correlation Stage;

Integrated Field Stage;

with frequent and oft-times vigorous oscillations between them. It is instructive to examine the field of physiological climatology in these terms.

The substance-property stage is characterized by unitary concepts of both the operating factors and the responses of the thing operated upon. As long as heat was considered a material substance represented by temperature alone, ideas of its significance for living organisms necessarily shared that concept. It was just this sort of limitation which prevented Blagden and Fordyce from realizing the full significance of their observations on heat regulation by evaporation. It was the clinical judgment of Franklin which enabled him to see relationships between conductive and evaporative cooling and anticipate the interchangeability we recognize today between the four "heat elements" in climate—temperature, humidity, air movement, and radiant energy. For the most part the substance-property stage in physiological climatology has been slight, since progression beyond this point by the fundamental sciences from which this field derives has been almost a prerequisite for their significant contribution to its development. There is today, however, a distinct tendency on the part of those coming into this field from other applied fields, notably those of meteorology and geography, to rely upon a too-simplified concept of the interacting entities, and to look for significant effects of a unitary environmental factor upon an organism behaving as a unitary being. The often enthusiastic description of a substance in the atmosphere affecting human behavior and welfare as a whole is one such example. Attribution of profound influence to the single process of fluctuations in barometric pressure is another. To the extent that such postulations draw attention to the possible influence of such factors in a complex of interactions, they are useful; but when pushed to the front as all-inclusive explanations they create antagonisms which do nothing to clarify their true significance. To the extent that studies of the effect of the "heat elements" are presented as totally explanatory, they too constitute a reversion to the substance-property stage.

Reversions, as Kantor suggests, are natural, and may be useful; but they are justified only as transitory stages, to be recognized and transformed, or to be avoided by intelligent anticipation if at all possible.

In contrast to the rather vague appearance of the former, the statistical-correlation stage is most marked. The works of Huntington, and Mills in this country, of Taylor in Australia and Canada, and of Markham in England are well-known examples. To examine the data of naturally occurring events is a natural and legitimate pursuit; but to this pursuit one must bring not only adequate techniques, but a considerable measure of caution, and a thoroughly open mind. Techniques have been slow in developing; with the result that some of the earlier studies can no longer be regarded as adequate. Their conclusions, however, have taken a rather firm hold upon the literature. Unless differences between quantities are unmistakably great, one now requires, in addition to figures for mean values, statements of the statistical significance of the differences. These are very seldom given in any except the most recent statistical analyses. In addition to a failure to appreciate the importance of statistical significance, there was very often a failure to understand the role of correlations as evidence. Statistical procedures, properly conducted, indicate the degree of association between two or more variables. But they do this with two important limitations—first, they do it only in so far as the association is contained in the data used; second, they say nothing as to the causal significance of the association. On the first point, available data are by no means always representative, or comparable from one set to another; and it is fatally easy to select, albeit unconsciously, those which favor a preconception. Obviously, the end product can be no better than the raw materials; but this is not always remembered.

But it is the second point that is most commonly at issue. There is a frequent assumption that, if "A" is statistically correlated with "B," there must be a causal relation between them. (The further and still less justified assumption is sometimes made that the relation is a direct one—"A" being the cause of "B," or vice-versa.) That there *might* be a causal relationship is a perfectly fair conclusion, and one would, in the absence of other evidence to the contrary, be perfectly justified in seeking further evidence of its existence or nature. It is at this point that one begins to pass from the simple statistical-correlation stage to that of the integrated field. The revealed correlation has given a clue: whether it turns out to be a valuable clue will be revealed by further research, usually along a different line. One could, of course, and often does go back and look for further data of a statistical nature; but modern science owes a large part of its development and present impetus to the experimental approach.

It is the emphasis placed upon the experimental approach that marks the current change in the procedures of physiological climatology. The difference of approach is basically simple, but its effects upon operating procedures and required techniques are far-reaching. As with all scientific procedures, one starts from certain hypotheses on the nature of things set up in the light of existing evidence, one

makes predictions of what would occur under given circumstances if the hypotheses were true, and then one tests those predictions against actual occurrences. But, instead of looking around or waiting for natural events to provide the tests, the experimental method deliberately sets up conditions to test them. These man-made tests, which we call "experiments," have the advantage over naturally occurring tests in being specifically directed to the question at issue, and of being repeatable, not only by the same investigator, but by anyone else who doubts the result and will take the trouble to repeat them. It is precisely this possibility of appeal to independent adjudication which gives strength to the experimental method in providing scientific evidence. It is the compounding of one experimental study with another, and that complex with yet another, that leads inevitably to integration. It is very largely the mass of compounded experimental evidence, each piece rigorously adherent to classical logic, that provides the experience from which the integrating mechanism of the human brain derives its unified concepts or field theories.

SUBDIVISIONS

In a field whose boundaries are ill-defined and fluid, subdivisions are *a fortiori* indeterminate, but to those who desire concrete indications of its interests and activities, the following will serve as examples.

Operation of Individual Climatic Elements

The mode of operation and more direct consequences of air temperature, humidity, and air movement upon the human body have received considerable attention; but as the understanding of these simpler elements has improved, the focus of attention has shifted to the much more complex study of radiant energy. Until recently, the general tendency was, either to eliminate heat exchange by radiation from consideration, or to standardize it by considering situations in which the mean black body temperature of the surroundings is the same as air temperature. This was obviously unrealistic, not only for man out of doors, but for many domestic and industrial situations as well, and called for early attention. Studies of heat elements in relation to animals tended to lag behind those in relation to man, but of recent years there has been a considerable acceleration, with the result that human and animal investigations now proceed in closely parallel fashion.

The photochemical properties of solar radiation have been fairly intensively studied in relation to normal skin, both human and animal, and in relation to abnormal conditions of the superficial tissues. Many of the considerations involved in these studies are similar to those arising in relation to the shorter X-radiation, and constitute a link with that highly specialized field.

By contrast, considerations of the direct effect of precipitation, topography, surface conditions, flora, and fauna have remained at the qualitative level, except for some relatively small attention to increases in metabolic rate produced by mechanical impedance. The interest in dusts, smokes, and gases characteristic of industrial hygiene has developed an affinity with physiological climatology through the effect of climatic conditions upon air pollution by industrial plants.

Group Operations of Climatic Elements

By far the greatest concentration of attention in this portion of the field has been focussed upon the combined operation of the "heat elements" in climate. The basic fact that all four of these elements—temperature, humidity, air movement, radiant energy—affect a single process, the loss of heat from the animal to the surroundings, provides adequate reason for this. Equations have been developed expressing at least the general laws governing this loss, and approximate parameters have been established. There are still technical difficulties in the way of a single general equation, however, and many special cases have to be considered, especially as regards detailed losses over small ranges of variability in operating factors. While some of the parameters for the operation upon animals have not been examined to the same extent as those referring to man, the basic considerations are applicable to all warm-blooded animals.

A limited amount of work has been done on the combined operation of elements as the psychological group, but progress is necessarily slow by reason of the difficult nature of the study and the indirect methods which must often be employed. On the metabolic effect of climatic elements, even less has been done for the combined operation than for the elements acting singly. It is probable that developments in calorimeter design now in progress will facilitate these studies.

Specific Physiological Reactions

Since a thorough knowledge of physiological processes is fundamental to a consideration of responses to specific stimuli, it is only natural that a considerable volume of work should have been done in this portion of the field. Some of it, indeed, was done by workers with little interest in or consciousness of the field of physiological climatology, and some of the most significant contributions were made by those who gave it only a parabolic war-time indulgence. There is scarcely a physiological process or system on which the effect of thermal stress is not recorded in the literature. The significance and utility of the information naturally varies with the primary interest of the investigator and the circumstances of its development, but most of it can now be viewed in fairly systematic relationship to other cognate processes and reactions. Here indeed is material for the development of an integrated field, if only the process of integration is taken competently in hand. As a convenient tool with which to effect integration, the use of modern computing devices has been considered. These may well be useful, but they are not of themselves integrative. Only the human mind can, at least for the present, achieve this—and accept responsibility for it.

Reactions of Total Organism

Physiology has not entirely escaped gestalt tendencies, nor is there any sound reason why it should. However much we may prefer to deal with reactions at a simpler level, an individual organism must react as a single unit to the total situation with which it is presented. The psychological penalties for habitual failure to do so are only too well known, and these have physiological counterparts. The

validity of the concept can hardly be questioned, but the methods presently available for its realization admittedly leave much to be desired. The psychological as well as the physiological aspects must have representation, but it is doubtful if they warrant the preponderant consideration that current procedures seem to allot to them. It would be less than just to attribute this to excessive enthusiasm on the part of psychologists: physiologists could be accused of being at least as excessively neglectful. To be sure, such considerations depart fairly much from the classical approach in which most physiologists were trained; but the scientific method is not wont to admit that any observable phenomena are beyond its ken. If present methods are inadequate, then better methods must be found. In the absence of any comprehensive but measurable physiological response, the physiological search has concentrated upon devising some rational integration of observed responses to limited combinations of climatic elements, or upon an integration of the elements themselves. It is not surprising that this approach has been largely confined to the operation of the heat elements—and it has already been admitted that complete success has not yet attended its efforts in that limited field. It must be pointed out, however, that a great deal of attention has been given by at least one school of physiologists to the concept that there are fundamental reactions to stress irrespective of its nature, and that indices, possibly in the form of endocrine products or reactions of defensive systems, should be actively sought. It is too early to estimate the likelihood of success from this quarter.

Applications to Human Welfare

There are many who maintain with Pope, "The proper study of mankind is Man." It is only to be expected, therefore, that human applications took precedence in the development of the field. It would not be an exaggeration to suggest, indeed, that considerations of human welfare have provided the strongest stimulus to its development. Man, moreover, is but a single species, which removes many otherwise distracting variables from consideration. From Hippocratic times on, the significance of climate for human endeavor has been a recurrent theme; but it is only of quite recent years that any system has appeared in these considerations. It is now possible, however, to proceed from the same basis of quantitative fact to logical considerations, not only of limitations imposed upon human comfort, performance, tolerance, or existence, but also of the significance of detailed design in clothing and housing, for the maintenance of relatively stable personal environments in spite of marked variation in ambient environments. The most important effect of intensive war-time study on this field was probably the crystallization of this basic unity of endeavor. There is, perhaps, no better criterion of arrival at the integrated-field stage than the discovery that the same basic principles are applicable in a number of aspects which formerly appeared unrelated.

Applications to Animal Industry

It is when one turns to considerations of other warm-blooded animals that one sees the chain reaction in its proper perspective. It was inevitable that ideas which

were proving so fruitful in considerations of human responses to climate should find application to the adaptation of other forms. This extension could only be accelerated by the economic importance of many of the non-human forms, and the fact that, in many respects, they are more reactive to climatic stress. Conversely, the information obtained from animal studies often suggested better investigations or better interpretations in human studies. So intimate has been the exchange, of recent years, that it is virtually impossible to assign primary responsibility for many of the developments. It would be a rash man who would predict at what part of this growth curve we are now situated. Dairy cattle have probably received the most direct attention, but sheep and poultry are not far behind, and swine have come in for a share of it. By comparison, the familiar laboratory animals have been almost neglected. The thermally less representative monotremes, marsupials, and edentates have been studied, but not with an intensity which matches the significance of their reactions for current disputes on evolutionary mechanisms.

Applications to Social Problems

In view of what has been said of the unsatisfactory nature of studies on the total organism, it might be thought that a consideration of their application would indeed resemble the proverbial pursuit of a non-existent cat in a dark cellar. History reveals, however, that the evolution of knowledge has not always pursued the logical course from the study of the simple to that of the complex. The exigencies of everyday life, moreover, demand action which shall be as intelligently directed as existing knowledge permits; and it appears obviously desirable that this direction should be based upon advice from those who have given careful thought to the evidence, poor though it may be. It has for many years been clear to the author that the general attitudes of temperate cultures toward the indigenous peoples of the tropics were not in accord with bioclimatic facts as he saw them; and that their estimate of the adaptability of their own kind to the prevailing conditions was equally suspect. Time is proving the essential correctness of his contentions, and in a way that is not always palatable. It is too much to expect attention for a juvenile voice in the wilderness, but this does illustrate the way in which socially applicable extrapolations could have been made, even at that stage of knowledge. Today there is room for more confidence and, perchance, more hope of being heard. Certainly there is no reason for ignominious retreat to the security of the ivory tower.

TRAINING

As a field of study develops it creates its own techniques, and its own pattern of thought, which newcomers to the field find it advantageous to learn; but this requirement for special instruction can be overdone. At all stages of its development, but particularly in its earlier history, any field can gain much from those who come to it with broader training and experience. It is far too early to set up specific prerequisites for workers in the field of physiological climatology. In this connection, it is gratifying to note that the committee of the American Meteorological So-

ciety which is considering the training required of "bioclimatologists" discourages the idea of a degree in the subject as premature, advocating, instead, the inclusion of appropriate basic studies in courses primarily directed to degrees in biological sciences, medicine, hygiene, or geography.

A similar liberality of attitude would seem to be required in respect of training for physiological climatology. To be sure, a sound knowledge of physiology is essential, but it is possible for one trained primarily as a climatologist or meteorologist to acquire this by graduate study. Certainly the physiologist will need to acquire a sound knowledge of at least thermal physics and, ideally, thermodynamics; but this is true of other fields in which physiologists are quite active. Intelligence, flexibility of mind, and an urge to understand are still the real prerequisites.

From what has been said, it will be clear that complete coverage of the intellectual requirements by one individual is impossible, and that within the field there will be many focal points. Men with one type of specialized experience and interest must integrate their ideas with those of men with different orientation. Many critical points will develop in relation to techniques. The simpler electronic devices are now commonplace in the laboratory, but skill in design and maintenance is still an accomplishment of the minority. With the increasing use of complex computers, and the possibilities opened up to telemetering, this type of technical demand is raised to new heights. Cartographic and nomographic problems are bound to increase and call for specialist technical consideration.

It may well develop, however, that the most difficult problem of all is the epistemologic one of achieving a sound integration of component facts into a more comprehensive expression. The problem is not unique to this field, of course, but it has a particular urgency in this connection which may provide the stimulus for more adequate formulation, not only of its nature, but of its necessary operative conditions and limitations. In the interim, one can recommend only the empirical training of each potential operator along the lines which have proved productive in other scientific arts.

REFERENCES

The following general references will serve as illustrations of the field content at various stages of its development; without necessarily implying agreement by the reviewer with opinions expressed.

- E. F. Adolph, *Physiology of Man in the Desert*. New York: Interscience Publications, 1947.
- American Society of Heating and Ventilating Engineers, *Heating, Ventilating, Airconditioning Guide*. New York: annual.
- C. Bladgen, "Experiments and observations in an heated room," *Philosophical Transactions, Royal Society of London*, LXV (1775): 111-123, 484-494.
- S. Brody, *Bioenergetics and Growth*. New York: Reinhold Publishing Company, 1945; also long series of Bulletins of the University of Missouri Agricultural Experiment Station, still appearing.
- B. Franklin, "Letter to J. Lining," 17 June, 1758. (Quoted by J. Sparks, *Complete Works of Benjamin Franklin*, 1882.)

- Hippocrates, *Genuine Works*, translated by F. Adams. Baltimore: William and Wilkins, 1939.
- E. Huntington, *Civilization and Climate*. New Haven: Yale University Press, 1915; 3rd ed., 1924.
- D. H. K. Lee, "Thoughts on housing for the humid tropics," *Geographical Review*, XLI (1951): 124-147; also "Physiological Principles in Hot Weather Housing," Washington: U. S. Housing and Home Finance Agency, 1953.
- D. H. K. Lee and H. Lemons, "Clothing for global man," *Geographical Review*, XXXIX (1939): 181-213.
- D. H. K. Lee and R. W. Phillips, "Assessment of the adaptability of livestock to climatic stress," *Journal of Animal Science*, VII (1942): 391-425.
- S. F. Markham, *Climate and the Energy of Nations*. Oxford: Oxford University Press, 1944.
- C. A. Mills, *Climate Makes the Man*. New York: Harper Brothers, 1942.
- H. H. Mitchell and M. Edman, *Nutrition and Climatic Stress*. Springfield, Illinois: C. C. Thomas, 1951.
- L. H. Newburgh (Editor), *The Physiology of Heat Regulation and the Science of Clothing*. Philadelphia: Saunders, 1949.
- W. F. Petersen, *The Weather as Destiny*. Springfield, Illinois: C. C. Thomas, 1943.
- A. G. Price, *White Settlers in the Tropics*. New York: American Geographical Society, 1939; reprinted 1951.
- G. Taylor, *Environment, Race, and Migration*. Chicago: University of Chicago Press, 1937.
- C. E. A. Winslow and L. P. Herrington, *Temperature and Human Life*. Princeton: Princeton University Press, 1949.

A GEOGRAPHIC ANALYSIS OF WHITE-NEGRO-INDIAN RACIAL MIXTURES IN EASTERN UNITED STATES*

EDWARD T. PRICE
Los Angeles State College

A STRANGE product of the mingling of races which followed the British entry into North America survives in the presence of a number of localized strains of peoples of mixed ancestry. Presumed to be part white with varying proportions of Indian and Negro blood,** they are recognized as of intermediate social status, sharing lot with neither white nor colored, and enjoying neither the governmental protection nor the tribal tie of the typical Indian descendants. A high degree of endogamy results from this special status, and their recognition is crystallized in the unusual group names applied to them by the country people.

The chief populations of this type are located and identified in Figure 1, which expresses their recurrence as a pattern of distribution.¹ Yet each is essentially a local phenomenon, a unique demographic body, defined only in its own terms and only by its own neighbors. A name applied to one group in one area would have no meaning relative to similar people elsewhere. This association of mixed-blood and particular place piques the geographic curiosity about a subject which, were it ubiquitous, might well be abandoned to the sociologist and social historian. What accounts for these cases of social endemism in the racially mixed population?

The total number of these mixed-bloods is probably between 50,000 and 100,000 persons. Individually recognized groups may run from fewer than 100 to as many as 18,000 persons in the case of the Croatans of North Carolina. The available records, the most useful being old census schedules,² indicate that the present numbers of mixed-bloods have sprung from the great reproductive increase of small initial populations; the prevalence in each group of a small number of oft-repeated surnames is in accord with such a conclusion. The ancestors of the mixed-bloods

* Grateful acknowledgement is made for financial assistance in the preparation of this paper from a special fund at the disposal of the Geology and Geography Department of the University of Cincinnati; it was used for field study in the Carolinas and Virginia in the summer of 1950 in the interests of running back the origins of mixed-blood groups previously studied elsewhere.

** The word *blood* is used throughout this paper to denote composition of racial ancestry.

¹ For a useful summary of these groups see W. H. Gilbert, "Memorandum Concerning the Characteristics of the Larger Mixed-Blood Islands of the Eastern United States," *Social Forces*, XXIV (1946): 438-447.

² Original schedules of United States Censuses not destroyed are available in the National Archives, Washington, D.C., in volumes identified by state, county, and year. Two indexed publications are particularly useful: U.S. Census Bureau, *Heads of Families at the First Census of the United States Taken in the Year 1790*, Washington, 1907-8; C. G. Woodson, *Free Negro Heads of Families in the United States in 1830*, Washington, 1925.

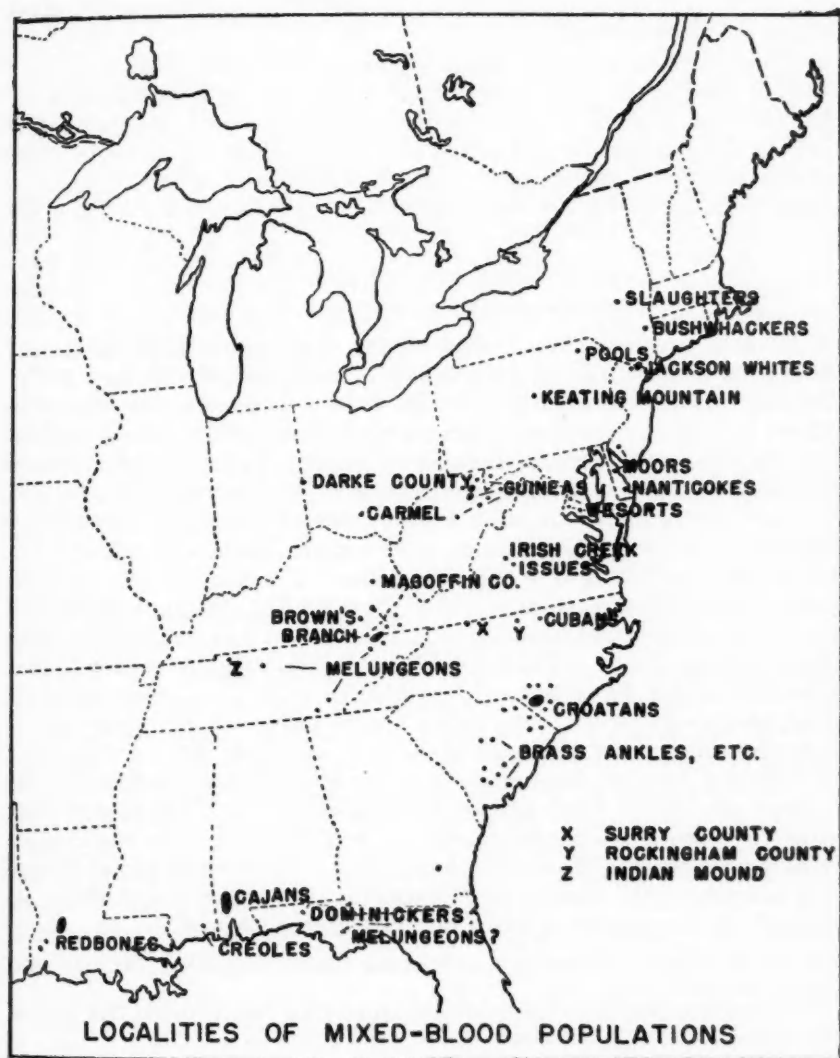


FIG. 1

have been free people (usually "free colored" in earlier censuses) for as long as their history can be traced; it is extremely unusual to find any evidence of slavery in their main ancestral lines.

The mixed-bloods are heterogeneous in physical appearance. Some of the population in some of the groups are unmistakably negroid in some characteristics. Proof of Indian ancestry rests more on tradition than on present appearance. The dark-skinned strain, however, does not seem to be due entirely to Negro blood; other negroid traits seem less clearly prevalent than darkness of skin. Skin colors among the mixed-bloods vary from white to brown, but few are as dark as an un-mixed Indian.

LARGER MIXED-BLOOD STRAINS

The Croatan Indians of North Carolina

Probable ancestors of the Croatan Indians were reported along the Lumber River at the time of the area's first settlement by Scotch people in the early 1730's,³ and they may be identical with a lawless band of swamp-dwellers reported in 1754.⁴ At least sixty-five family heads can be identified in the census of 1790, but the groups seem to have remained relatively obscure until after the Civil War when one member of the group acquired notoriety for his exploits as an outlaw.⁵

The Croatans' demand for status found a champion in the person of Hamilton McMillan, a member of the legislature which conferred on them the title of "Croatan Indians," later changed to "Cherokee Indians of Robeson County"⁶ over the protests of the Cherokees of eastern North Carolina. The Croatans have had their own Indian school system, separate from both white and Negro, culminating in the State Teachers' College at Pembroke. The census has tabulated them as Indians since 1890, and has shown their amazing rate of growth.⁷ The Croatans are mostly small farmers engaged in growing cotton, tobacco, and corn in the western part of Robeson County, where they dominate the rural settlement. Even in their center of Pembroke, however, the business is mostly in the hands of whites, and the Croatans are resentful of their own lack of influence and status.⁸ The latter is closely related to apparent or suspected presence of Negro blood, a matter which has internally compartmented the Croatan society itself. The Croatans appear in numbers in several nearby counties, and "Croatan" as a designation of race appears occasionally in the marriage records of even more distant localities.

³ Guy B. Johnson, "Personality in a White-Negro-Indian Community," *American Sociological Review*, IV (1939): 519.

⁴ J. R. Swanton, "Probable Identity of the Croatan Indians," *Senate Reports*, 73rd Congress, 2nd Session, Calendar No. 229, Report No. 204, Washington, 1934: 5.

⁵ Johnson, *op. cit.*, 517-518.

⁶ *Ibid.*, pp. 518, 520.

⁷ See R. M. Harper, "A Statistical Study of the Croatans," *Rural Sociology*, II (1937): 444-456, and "The Most Prolific People in the United States," *Eugenical News*, XXIII (1938): 29-31.

⁸ Johnson, *op. cit.*, p. 522.

A popularly held theory that Raleigh's Lost Colony survives in one of the mixed-blood groups usually centers on the Croatans. It is difficult to tell whether this idea has been a tradition among the Croatans, or was only popular for a time in the late nineteenth century as a device for gaining status. The case built by McMillan⁹ for historical continuity of the Lost Colony and the Croatans seems to have been successfully refuted by Swanton.¹⁰ McMillan also lists the names of the members of the Lost Colony, alleging a similarity to Robeson County names.¹¹ Such a similarity was not evidenced by names in the census of 1790, nor are the most frequent Croatan surnames on the Lost Colony list at all. Indeed Locklear and Oxendine, the two most common names, covering nearly a third of the Croatans,¹² seem to be virtually unique to the Croatans. They were not reported among whites in the 1790 census, and so few free colored families of those names appeared outside of Robeson County in either 1790 or 1830 that an origin among the Croatans is indicated (Fig. 2).

The density of free Negroes in 1830 was greater in Robeson County (where they were mostly Croatans) than in any other county in the southern half of North Carolina. Whatever aberration from the usual bi-racial pattern resulted in the Croatans evidently had a quantitative as well as a qualitative aspect. Whether this process was immigration, a conservative lack of emigration, high fertility, or simply an early start is an unanswered question.

The Melungeons

The Melungeons¹³ centering in Hancock County, Tennessee, are sometimes said to derive from the Croatans, but the comparison of names suggests only a tenuous connection. The Melungeons reached Newman's Ridge and Blackwater Valley (in Hancock County) among the first settlers, apparently in the 1790's. The number and ages of family heads bearing the names of Collins, Gibson, and Goins in 1830 suggest that several households with these names were involved in the original migrations from North Carolina and Virginia. By 1830 the Melungeon colony included 330 persons in 55 families in Hawkins County (from which Hancock was formed) and 130 persons in 24 families in adjoining Grainger County. Because of them Hawkins County showed more free colored persons in the 1830 census than any other county in Tennessee except Davidson (Nashville) and more free colored families named Collins than any other county in the United States. A few Melungeons persisted until 1830 in Ashe County in northwestern North Carolina; the

⁹ Sir Walter Raleigh's *Lost Colony*, revised edition, Raleigh, 1907 (earlier edition, 1888).

¹⁰ *Op. cit.*, pp. 3-6.

¹¹ *Op. cit.*, p. 35.

¹² Lists of students at Pembroke State College, taken from Catalog II, No. 4, June, 1949 give the following percentage frequencies for the most common names: Locklear 17, Oxendine 13, Lowrie 9, Sampson 6, Chavis 5, Dial 4, Maynor 4, Hunt 4.

¹³ Edward T. Price, "The Melungeons: a Mixed-Blood Strain of the Southern Appalachians," *Geographical Review*, XLI (1951): 256-271.

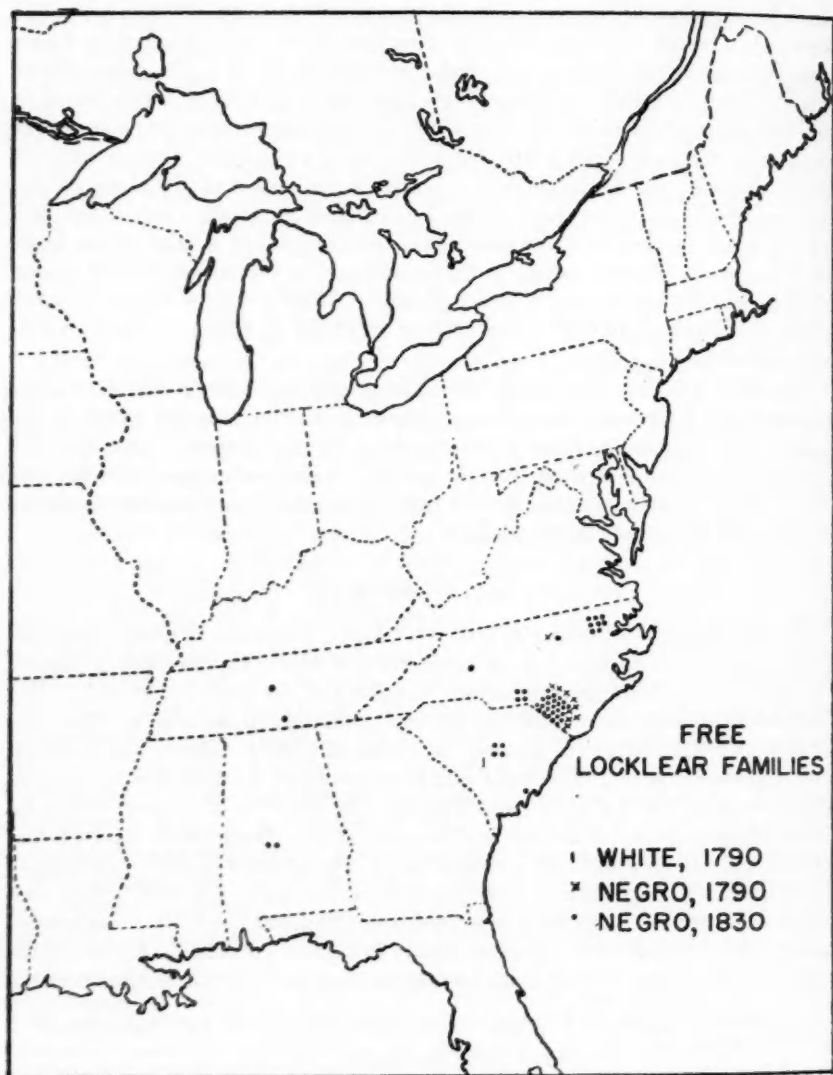


FIG. 2. The Locklears in Halifax County are apparently not recognized today.

records of that area contain the earliest references to Vardy Collins,¹⁴ said to be the first of the Melungeon settlers.

A few of the Melungeons of today resemble Indians, but more are impossible to distinguish from white mountaineers. A caste distinction persists to a considerable degree, though the Melungeons are not segregated in schools. Melungeons are found in some numbers in Lee, Scott, and Wise County, Virginia, Letcher County, Kentucky, and in Graysville, Tennessee, and occasionally on and west of the Cumberland Plateau. In these more distant localities they are not always identified as Melungeons, but bear the characteristic surnames. Historical records do not supply proof for their likely relationship to the Hancock County group, and some of these other settlements are also very old. The name of Goins is particularly associated with Melungeons living south and west of Hancock County.

The Redbones of Louisiana

Five parishes of southwest Louisiana—Calcasieu, Rapides, Beauregard, Vernon, and Allen—include in their population a strain of mixed-bloods identified as Redbones. Louisiana, with its French background, is probably the state where mixture of white and Negro blood has been most typical; a number of concentrations of such peoples are recognized. The markedly English names of the Redbones and their Protestant religious affiliations (usually Baptist) demarcate the Redbones from all these other Louisiana mixed-bloods, with whom this study is not concerned.

The Redbones appear clearly in the earliest census records of the area as free colored persons, usually the only free colored persons with English names in the present areas. Later records identify the same persons as mulattoes; when the listed birthplace is outside of Louisiana, South Carolina is usually the state. Olmsted in 1857¹⁵ mentions a wealthy mulatto family of Ashworths near the border in east Texas, which is quite likely connected with the Redbones of the same name. Evidently the Redbones were mixed in blood when they came as cattle-grazers to this last-settled corner of Louisiana. Further support for believing their origin to be South Carolina stems from the facts that Redbone is an old Carolina term for mixed-bloods,¹⁶ that several Redbone names occurred among free Negroes of South Carolina, and that several names of South Carolina mixed-bloods occurred with the Redbones in earlier censuses.

The Redbones probably number 3000 or more. They are not segregated in schools, though several rural areas and two or three villages are predominantly Redbone in population. Many of the Redbones have drifted into the towns to take various jobs in recent years. In spite of the absence of any official recognition or

¹⁴ The earliest is from the April term of Wilkes County (then containing Ashe) Court, 1790, case 10, *State vs. Vardy Collins*; case 11 was *State vs. Jordan Gibson*.

¹⁵ Frederick Law Olmsted, *A Journey Through Texas*, New York, 1857, pp. 386-7.

¹⁶ Stephen B. Weeks, "The Lost Colony of Roanoke: its Fate and Survival," *Papers of the American Historical Association*, V (1891): 466; Brewton Berry, "The Mestizos of South Carolina," *American Journal of Sociology*, LI (1945): 34.

rigid segregation, the Redbones form what is essentially a caste; and they are homogeneous in economic class, the small subsistence farm or labor in forest or mill providing the livelihood.

The term Redbone suggests Indian blood, which is reported to have been evident among some of the older Redbones. The status the Redbones hold and the appearance of many of the Redbones today suggest an admixture of Negro blood. No one is called a Redbone to his face, but the term is universally understood in southwest Louisiana, and the members of a Redbone family will be so tagged as long as they continue to live in the area.

The Cajans of Alabama

The nucleus of American settlement in Alabama was a small exclave on the west bank of the lower Tombigbee and Mobile Rivers which, in the early nineteenth century, was surrounded by Spanish Mobile to the south and Indian tribes on the other sides—Creek, Choctaw, and Cherokee.¹⁷ Into this frontier came a free colored man named Reed, said to have been a mulatto from Jamaica; he married a slave woman, also a mulatto, whose freedom he later purchased,¹⁸ and the two operated a cattle-penning center in conjunction with an inn along the road into Mississippi. The Reeds had eight children, 56 grandchildren, and at least 202 great grandchildren;¹⁹ by today the eighth or ninth generation has appeared, and the descent of the Reeds is innumerable. A free colored couple named Byrd, who probably came into the area a little later, are known to have produced 119 great grandchildren, and a Weaver family traced back to two family heads has been equally prolific.

About half of the population of over 2000 Cajans in Mobile and Washington Counties in Alabama bear the names of Weaver, Reed, and Byrd. The descendants of these families were not numerous until after the Civil War, but their previous status of freedom and their mixed race may account for their subsequent separation from the other Negroes. Certainly their rapid growth in numbers and their intermarriage of one family with another help to explain the recognition by the white population which ultimately resulted in borrowing (with a slight modification in spelling) the term Cajan from Louisiana to identify them.

Today the Cajans live in a clearly circumscribed rural area of the pine forests containing about 175 square miles. Their children attend special schools provided by the counties. Perhaps another 2000 Cajans have managed to slip into towns or cities where they are not actively thrown with the core of the group.

The Cajans have not only survived, but have steadily grown in this area of change and instability. After the cattlegrazers came the lumber and railroad

¹⁷ Peter Joseph Hamilton, "Early Roads of Alabama," *Transactions of Alabama Historical Society*, II (1897-8): 47.

¹⁸ Harry Toulmin, *Digest of Alabama Laws*, New York, 1823, p. 642.

¹⁹ Lineage book of mixed-blood families (typewritten ms.) prepared for Mobile School Board, ca. 1931.

camps. Geronimo's Indians were detained at nearby Mt. Vernon in 1890.²⁰ Each of these transient groups and many others may have contributed blood to the Cajans.

The exhaustion of the forests has left the slim leavings to the Cajans. Many of them are squatters on large landholdings; most of them work in the forest industries, lumbering, turpentineing, hauling logs, operating sawmills. Increasing population in an area of depleted resources cannot continue indefinitely. Some of the Cajans leave the region and pass as white in distant localities; these are usually the lighter-skinned. A conservatism tends to hold most of them near home. The emigration has not kept up with the growth by reproduction, but it probably balances occasional intermarriage with whites to keep most of the residual Cajan population moderately dark-skinned.

The Issues of Amherst County, Virginia

A concentration of several hundred Issues (a term applied to Negroes freed before the Civil War) has long been recognized at the eastern foot of the Blue Ridge near Amherst, Virginia. They are mostly a laboring group, working on the tobacco farms of the Piedmont and the apple orchards of the slopes above and as domestic servants. The mulatto ancestors of the Issues were in the area by 1785, but little is known of their history; one of the group was mentioned as a free mulatto in 1848.²¹ The idea that the group has some Indian blood persists, however.²²

Emigration, especially to New Jersey during the War, has reduced the number of Issues materially. This movement seems to be the result of the assiduousness of the Virginia Department of Vital Statistics in its campaign to label as Negroes in all official records those with any fraction of Negro ancestry. This threat to their previous intermediate status was distasteful.

A possibly related group have been mountain farmers on Irish Creek on the western side of the Blue Ridge; they have not been excluded from white schools in Rockbridge County.

The Guineas of West Virginia

Most of the Guineas²³ live in Barbour and Taylor Counties in north central West Virginia, but they are known in several other counties also. This is an area of very few other colored people; though the Guineas attend the colored schools, they have resisted this segregation and would probably resist more forcibly if the schools had more Negro children and Negro teachers. The 1600 or more Guineas in Barbour and Taylor Counties are mostly peasant farmers, coal miners, day laborers, and domestic servants. A very few are wealthy. They live in several rural

²⁰ U.S. Census Office, Eleventh Census, *Report on Indians Taxed and Indians not Taxed*, Washington, 1894, p. 132.

²¹ John Jaquelin Ambler, ms. journal, Amherst, 1848, p. 60.

²² The group is anonymously examined in Arthur H. Estabrook and Ivan E. McDougale, *Mongrel Virginians*, Baltimore, 1926.

²³ Gilbert, "Mixed Bloods of the Upper Monongahela Valley, West Virginia," *Journal of the Washington Academy of Sciences*, XXXVI (1946): 1-13.

concentrations where their ownership of land dates from early in the nineteenth century,²⁴ in others where they have more recently replaced whites, and in some numbers in the towns.

Several surnames belong almost exclusively to Guineas in this area, but nearly half the group are named Mayle (formerly spelled Mail, Male, etc.).²⁵ There are several traditions of Indian blood among the Guineas, but the records confirm only the "colored" and mulatto mixtures. The records of the Guineas' ancestors all trace back to Virginia (then including West Virginia); they were in the western part of the state well before 1800. The mixed-bloods seem to have reached this area from several different directions before their increase to the present population. The Mayles, and perhaps other Guinea families came from Hampshire County, where they may have been people of some means. Just when the Mayle family became mixed-blooded is not clear, but it evidently occurred before 1810, when they had already started moving westward into the Plateau. The census evidence indicates that all of the Mayles of the Guinea group, numbering over 700 in Barbour and Taylor Counties, are either actual or legal descendants of one man. Most of the Guinea settlement in Taylor County has developed from Barbour County in the last two generations, and more recently the Guineas have settled in some numbers in several Ohio cities and in Detroit.

The Wesorts of Maryland

A vaguely defined mixed-blood group known as Wesorts²⁶ form part of the population of the southeastern peninsula of Maryland west of Chesapeake Bay, within an hour's drive of Washington. Their number is estimated at between 750 and 3000. Their children attend both white and colored schools. Twenty-six Wesort surnames have been identified, most of which were among the 54 family names of free colored persons in the area in 1790; most of the names were also common among whites of the area at the same time.

The Moors and Nanticokes of Delaware

Two mixed groups, probably related to one another, live chiefly in Delaware.²⁷ The Moors, numbering about 500, are in a suburb of Dover, and the Nanticokes, numbering about 700, live in the southeast part of the state near the estuary of the Indian River. The former support themselves from various wage jobs, while the latter have retained their modest farms in the Indian River Hundred. Most of their children attend an assortment of special schools, both public and private, which has resulted from internal differences and misunderstandings with officials.

²⁴ Deed books of Barbour and Harrison Counties.

²⁵ Based on school census and voter registration; in the latter the following families had the given percentages of the total number of Guineas: Mayle 45, Croston 11, Kennedy 10, Dalton 8, Newman 7.

²⁶ Gilbert, "The Wesorts of Southern Maryland, an Outcasted Group," *Journal of the Washington Academy of Sciences*, XXXV (1945): 237-246.

²⁷ C. A. Weslager, *Delaware's Forgotten Folk*, Philadelphia, 1943.

The Nanticoke leaders have recently tried to revive their Indian birthright through the formation of the Nanticoke Indian Association. In spite of the fact that their economy has made use of a surprising number of Indian culture traits,²⁸ there is little evidence at hand to connect them directly with the aborigines of Delaware. Their claim to Indian status seems neither stronger nor weaker than that of several other mixed-blood groups.

The Jackson Whites of New York and New Jersey

The Jackson Whites, the only large mixed group of the North, is the only one whose members have been willing to throw in their lot with the Negroes, though they do not class themselves with the colored population at large. Though within easy commuting distance of New York City (Bergen County, New Jersey, and Rockland County, New York), their existence has apparently depended historically on a refuge in the fault-bounded Ramapo Hills. Their names of Mann, DeGroat, DeFreese, and Van Dunk suggest a relation to the Dutch settlers of New York; all of these names but the last are old²⁹ in the area, while a de Vries appeared in a seventeenth century reference³⁰ as a free Negro.

The early history of the Jackson Whites is obscure, and no hypotheses or theories³¹ seem to find much confirmation in records. The people seem to have supported themselves on the mountain during the nineteenth century by farming and producing forest products such as charcoal, baskets, barrel staves, brooms, and wooden tools.³² Missionary work on the mountain and increased job opportunities in the lowlands have made the Jackson Whites a part of modern society. Most of them have moved into the lowland towns and taken jobs in the shops and mills. Segregation in a colored grade school in one of the New York communities was ended in 1947. Traditions among the Jackson Whites themselves indicate either a very diverse ethnic background or a complete confusion over the actual truth.

SMALLER GROUPS OF MIXED-BLOODS

Nineteen separate groups of mixed-blood peoples have been identified on the Coastal Plain of South Carolina.³³ Typically they live somewhat apart from other groups in rural settings with their own clusters of shacks. Their employment is mostly in agricultural labor. In most cases special schools are provided.

²⁸ Frank G. Speck, "The Nanticoke Community of Delaware," *Contributions from the Museum of the American Indian*, II (1915), No. 4.

²⁹ Constance Crawford, *The Jackson Whites*, M.A. thesis, School of Education, New York University, 1940, p. 41.

³⁰ George H. Budke, "The History of the Tappan Patent," *The Rockland Record* (Rockland County Society of the State of New York), II (1931-2): 35.

³¹ See J. C. Storms, *Origin of the Jackson Whites of the Ramapo Mountains*, Park Ridge, N. J., 1945.

³² "Community of Outcasts," *Appleton's Journal*, VII (1872): 324-329.

³³ Berry, *op. cit.*, pp. 34-41.

The groups may have formed around the small lowland Indian tribes as nuclei, picking up both white and Negro blood.⁵⁴ Characteristic names are recognized in each locality, but certain names tend to be common in several counties, sometimes linking the South Carolina groups with Croatans and other larger groups. The South Carolina mixed-bloods, on the whole, are said to be making gains toward white status. A number of group names—*e.g.*, Brass Ankles, Redbones, Redlegs, Buckheads, Turks—are applied locally to these peoples. Their social differentiation seems to be a pattern of long standing in South Carolina.

North Carolina is also prominent on the map of mixed-bloods. Its school directory lists 27 Indian schools.⁵⁵ Goins is the chief surname among a scattering of alleged mixed-bloods in Surry, Stokes, and Rockingham Counties, North Carolina, and adjoining Patrick County, Virginia. Though one Indian school is maintained for these people, they have, in at least one case, won suit for admission to white schools. Usually they attend white schools and are distinguished only socially by their neighbors. Their total number is at least several hundred. The compact land ownership around Gointown in Rockingham County suggests it as being of longest standing as a center for this strain; land records carry them back in that part of the county to its formation in 1786. A similar situation occurs in Moore County in southern North Carolina with the difference that the Goinses and their associates are classed as Negro, but mix little with other Negroes.

Magoffin County in the Kentucky Mountains has a small mixed-blood population considered to be of Indian mixture.⁵⁶ They are noted in the county as mountain farmers with large families whom they are able to maintain without apparent means of support. The people have been in the county as long as records have been maintained. Their surnames have all been associated with Melungeons in the records, though some of the early Magoffin County mixed-bloods were themselves born in Virginia and North Carolina. A colony of the Magoffin County group planted itself near Carmel, Ohio, about the time of the Civil War. At the very edge of the Appalachians, they built their shacks in the hills where they obtained shelter, wood, game, and ginseng, providing farm labor at times on the more fertile plains. Some of the group are now rooted in Carmel, but close contact is yet maintained with relatives in Magoffin County.

Ohio has a second small group living in the rich Corn Belt land of Darke County. Admittedly part Negro, members of this group are descended from ancestors who began settlement there by 1822. A number of families, all of whom came from the southeast, apparently found here an escape from the anomalous po-

⁵⁴ *Ibid.*, p. 35.

⁵⁵ *Educational Directory of North Carolina, 1949-1950*, Publication No. 273, Issued by the State Superintendent of Public Instruction, Raleigh. Only two of these schools are more than two counties removed from the Croatan center; at least two other such Indian schools have existed in the past.

⁵⁶ Edward T. Price, "The Mixed-Blood Racial Strain of Carmel, Ohio, and Magoffin County, Kentucky," *Ohio Journal of Science*, L (1950), 281-290.

sition of the free Negro in the slave states. The colony is fairly prosperous although the farms are somewhat smaller than the average about them; subdivision through inheritance probably accounts for this condition.

Other small mixed-blood groups are indicated on the map in Figure 1.

INTERPRETATION OF MIXED-BLOOD DISTRIBUTION

The mixed-blood groups generally appear to have arisen from diverse sources. Where records are available, they indicate that the ancestors of the present mixed-bloods, coming into their present areas at the time of American settlement, were themselves mixed. The mixing must have had a beginning, of course; the old records are lacking for the easternmost groups where settlement was earlier. The surnames of the mixed-blood people are usually distinctive in their areas; if their names are taken from white people, such event seems to pre-date settlement in the present areas.

The mixed-blood groups are not closely associated with particular physical refuge areas in most cases; more broadly, however, Figure 1 shows that most of them live in the Coastal Plain and Appalachian Provinces—areas generally marginal in soil fertility and irregular in utility, accessibility, and settlement. Though typically, but not entirely, a Southern phenomenon, mixed-blood groups are not typical of the old Cotton Belt, but rather outline its edges. Borders of some nature seem to be favorite locations. The Redbones near the old Texas border, the Jackson Whites, Issues, and Carmel groups near borders between hills and plains, the Cajans on the old Spanish frontier, and many groups near state boundaries may be locationally related to the meeting of two worlds.

The conservative nature of these groups is evidenced by the fact that the boys who saw service during the second World War, usually in white units, have regularly returned to their homes. One stream of mixed-bloods does leave the focal areas to pass as white in cities and elsewhere, ultimately losing touch completely with the original group. The home areas often present limited opportunity in the economic niches open to the mixed-bloods. Some expand in areal extent, some in replacing white groups, but generally their populations are restricted, and their increase as identifiable mixed-bloods does not approach their actual reproductive growth.

Many of the mixed-blood groups seem unrelated or unimportantly related one to the other. Perhaps they represent similar responses to similar social conditions, each in a different area. The records of the surnames and birthplaces, however, tie a number of the groups together: the Croatans and many small groups of the Carolinas and Virginia; the Melungeons; the Redbones; the mixed-bloods of Magoffin County; and the two small groups mentioned in Ohio.

Though certain facts concerning the origin of these peoples have been traced, the questions of who they were and why they displayed this unusual clannishness have hardly been touched. The relationships mentioned suggest the hypothesis of

a colonial mixed-blood society having origin in Virginia and the Carolinas, consisting of a number of localized concentrations as well as *floaters* who served to maintain or effect both blood and social ties between the sedentary groups. Though the early groups certainly grew by accretion, chance colonization of a few members of this society in a new location may have been the necessary condition for a new localization of the same type. They seem to have moved westward into and across the Appalachians with the general stream of population. It is difficult to trace specific parenthood of one group by another, but numerous interrelationships are indicated by the records.

ORIGIN OF THE MIXED-BLOOD GROUPS

The records needed to probe the origin and nature of this society are, if existent, not available through the common indices and card catalogues. Perhaps they may be accidentally turned up. Some suggestive fragments are herewith presented.

The Goins Family

The name Goins seems to be a peculiar marker of these mixed-bloods. It has already been mentioned in connection with the Melungeons and certain strains in North Carolina. It is prominent among the mixed-bloods of Darke County, Ohio, and was associated with the Redbones in what is now Calcasieu Parish. It is a minor name among the Croatans and is the chief name among a mixed-blood group with a special school in Williamsburg County, South Carolina. Further, Goins is an unusual name; though many whites are named Goins, it occurred with a much greater frequency among free colored persons in 1830 (2.8 per thousand) than among the population at large in 1790 (0.1 per thousand in six populous Southern and Middle states).

Over a hundred free colored families named Goins were well scattered in 1830 through the South and southern parts of the Northern border states (Fig. 3). The two greatest concentrations occurred in the Melungeon area and the North Carolina-Virginia Piedmont where so many are found today. The former was almost certainly derived from the latter.³⁷ The concentration in central Virginia may be older than these, but is not known to have persisted.

The Goins name arrived in Virginia early,³⁸ one "Tho: Gowen" having been

³⁷ A census-taker in Lee County, Va., in 1870 recorded county of birth (whereas only the state was requested). A mulatto Goins family had adults born in Surry and Ashe Counties, N. C., and children born in Hancock, Grainger, and Knox Counties, Tennessee. All except the last are mixed-blood localities of some importance.

³⁸ This statement is based on the identity of the names Goins and Gowen (along with *Going*, *Gowings*, *Goyne*, etc.), which are certainly indistinguishable in the records. Those who would derive Goins from the Portuguese *Gões*, of course, present a problem of different nature (lining up with those who suggest *Chaves* as the derivation of *Chavis*, discussed below; the suggestion of an Iberian origin for the mixed-bloods is widespread, but not supported by direct evidence). Goins is also said by McMillan (*op. cit.*, 40) to have been derived from O'Guin in Robeson County.

listed as a passenger on the *Globe* in 1635.³⁹ One account of the better known branch of the family⁴⁰ has them spreading southward from a center in Stafford County, Virginia. A colored servant, Mihill Gowen, was released after four years of service in 1657;⁴¹ It may be noted that Gowen had not been the name of his mistress. The same unusual name (Mihil Goen) crops up again in 1718 in James City County as former owner of escheat land being patented by another man.⁴² A muster roll of a Granville County, North Carolina, regiment in 1754 singled out five men in one company as mulattoes; three of them were named Gowen.⁴³ A roster of North Carolina Revolutionary soldiers of 1778 lists a Gowan as a mulatto.⁴⁴ A 1792 entry in a deed book of Fairfield County, South Carolina,⁴⁵ records the fact that Levi Goyen made his friend John Goyen his attorney for handling a parcel of land in "Daverson Co. N.C. aforesaid land being first in the hands of David Goyen dec'd free Mallatto went to Cumberland River in the year 1770 and were killed by the Indians in the year 1780 and left the said Mallatto Levi Goyen his proper heir. . . ." The records available leave open the possibility that a branch of the Gowen family emerged as free mixed-bloods in the seventeenth century. Russell uses Mihill Gowen⁴⁶ to illustrate his contention that the early Negro servitude was usually an indenture rather than a permanent slavery. Can the mixed-bloods have had such an origin as free men, maintaining ever since the social barrier against the freed slaves? Certainly such a phenomenon as the Goins family must have a definite story behind it, but has it made its way into the records?

No real center of the Goins mixed-bloods can be identified antedating their concentration in the upper Piedmont. It is understood that the settlement of these counties was mostly from Virginia; this is in keeping with the above observation on southward spread of the Gowen family. The oldest Goinses recorded in the North Carolina portion of this district in the 1850 census were born in Virginia.

The Chavis Family

Another widespread name among mixed-bloods is Chavis (Chavous, Chavers, probably Shavers, etc.) (Fig. 4). Whereas Goins was more frequent among free colored people than whites, Chavis was also more numerous among the free colored.

³⁹ John Camden Hotten, *The Original Lists of Persons of Quality . . . and Others who Went from Great Britain to the American Plantations, 1600-1700*, London, 1874, 119.

⁴⁰ (Mrs.) A. Evans Wynn, *Southern Lineages*, Atlanta, 1910, pp. 319 *et seq.*

⁴¹ John H. Russell, "The Free Negro in Virginia, 1619-1865," *Johns Hopkins University Studies in Historical and Political Science*, XXXI (1913): 47 and Ms. Court Records of York County, 1657-1662, p. 45, filed in Virginia State Library, Richmond.

⁴² "Patents Issued During the Regal Government," *William and Mary Historical Quarterly Magazine*, 1st series, XII (1904): 189.

⁴³ *The State Records of North Carolina*. Goldsboro, N. C., 1886-1907, XXII, 372.

⁴⁴ *Roster of Soldiers from North Carolina in the American Revolution*, Durham, 1932, p. 600.

⁴⁵ *Deed Book A*, p. 162, filed in courthouse at Winnsboro.

⁴⁶ *Loc. cit.*

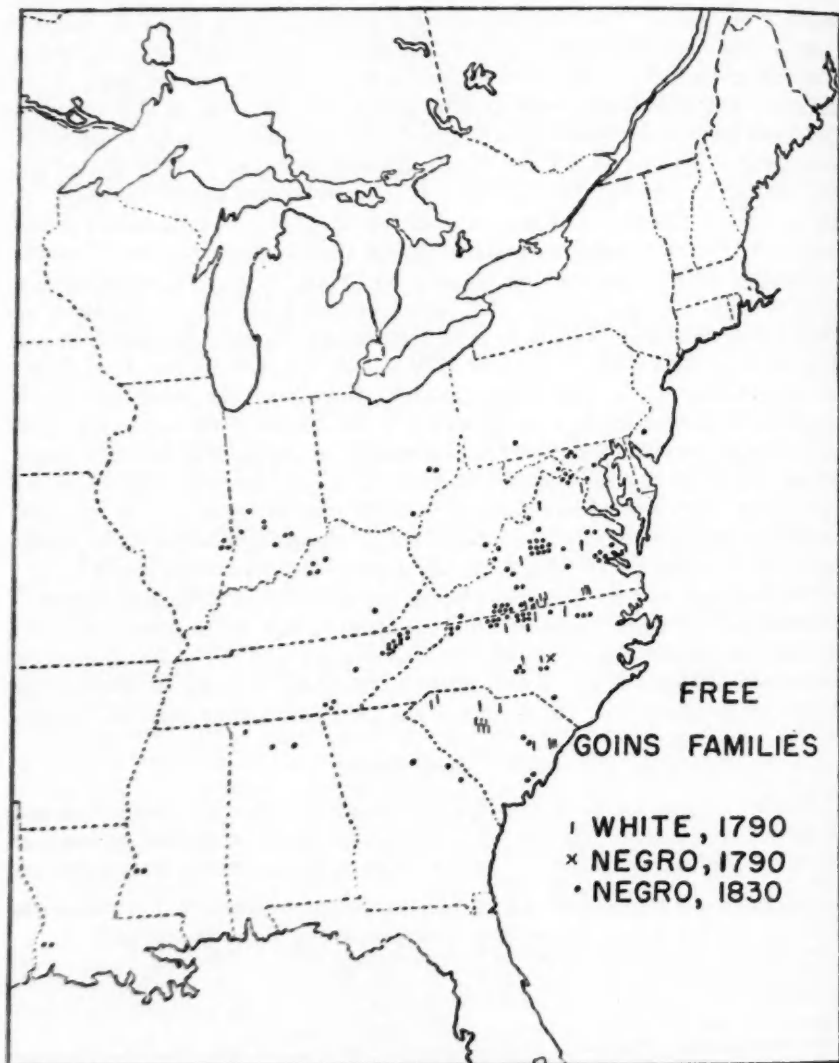


FIG. 3. (Used by permission of the *Geographical Review*.)

One free Negro of the name rose to fame as an educator.⁴⁷ Chavis is a prominent Croatan name. It has been reported in South Carolina as a mixed-blood name, *e.g.*, in Orangeburg County, and its association with the Melungeons and Redbones is suggested by the records. A Granville County muster roll of 1754 lists three members of the family, one as a Negro, the other two (at least one a son of the first) as mulattoes.⁴⁸ Colored slaveholders of the name were identified in Virginia by Jackson⁴⁹ in Charlotte County and Russell⁵⁰ in Mecklenburg County. They are identified as South Carolina frontiersmen in 1751 and 1752.⁵¹ Again an interesting story should unfold could the family and name be traced to their beginnings.

A number of other names seem to be frequent tracers of people of these mixed-blood castes, not only in the Carolinas and Virginia, but also in other states to their west. Bass, Epps, Scott, Bell, Sweat, and Revels are good examples. In addition there are less definite suggestions or fewer cases of still other names of which the following may be given as examples: Bolton, Braveboy, Cumbo, Harris, Newsom, Russell. Many of these names are common among whites and are of no use in the present connection unless identified as separate from their occurrence in the population at large.

An example of the suggestive co-occurrence of several of these names may be found in a document of 1822.⁵² A list of free people of color in Richland District, South Carolina, delinquent in the personal tax expected of them in 1821 and 1822 includes prominently the names of Oxendine, Locklier, Chavis, Sweat (Redbones and South Carolina groups), Gibson (Melungeons), and Jacobs. The last name is important in a mixed-blood group in Richland County today, a group of localized residents known as Sandhillers; it is also the name of probably a few hundred Croatans. Accompanying the list of delinquents is a petition to the House of Representatives on the estate of the then late district sheriff, begging release from the payment of the uncollected tax because "the time allowed by the Law for the return of these Executions is so short, and the *difficulty of finding them on account of the peculiar situation of their place of residence*, is such, that it was impossible for the Sheriff to collect. . . ."⁵³ A seclusion of the mixed-bloods in an inaccessible location is definitely implied, yet their separation was not so perfect that the sheriff did

⁴⁷ *E.g.*, see John Hope Franklin, *From Slavery to Freedom*, New York, 1947, p. 227.

⁴⁸ *The North Carolina State and Colonial Records*, XXII, p. 370.

⁴⁹ Luther P. Jackson, *Free Negro Labor and Property Holding in Virginia, 1830-1860*, New York, 1942, p. 216.

⁵⁰ James S. Russell, "Rural Economic Progress of the Negro in Virginia," *Journal of Negro History*, XI (1926): 559.

⁵¹ Kenneth Wiggins Porter, "Negroes on the Southern Frontier," *Journal of Negro History*, XXXIII (1948): 74.

⁵² Filed with documents under head of "Free Persons of Color in the South Carolina State Archives, Columbia.

⁵³ Present writer's italics.

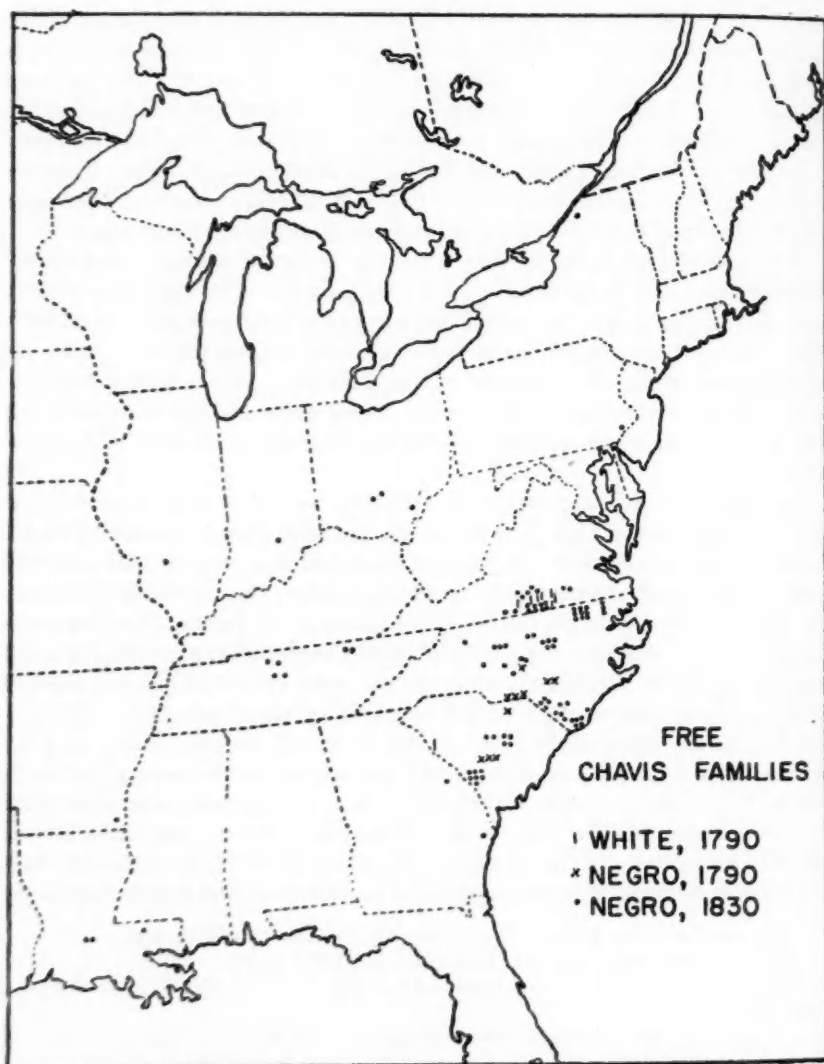


FIG. 4.

not have a list of their names. The people with whom the sheriff was timid about dealing were likely the ancestors of the present Sandhillers; they almost certainly included some Croatan families, and the names suggest connection with other mixed-bloods too.

The social attitude of these mixed-bloods must have been such that they found it congenial to take up with others of their own kind. They seem to have persisted in the static societies of rural areas, stimulated perhaps by tradition of Indian blood or pride of early freedom.⁵⁴

⁵⁴ Since the completion of this article Mr. Calvin L. Beale of the Census Bureau has informed me of the results of his examination of these mixed-blood groups as they appeared in the 1950 Census. They could be identified with reasonable accuracy from a list of the known surnames, by their sequence in the list, and by evidence of intermarriage obtained from maiden names. The data tend to confirm most of the population estimates and to strengthen considerably the evidence of connections between certain groups. The Magoffin County group seem to be twice as numerous as estimated (500 or more), and a number of small concentrations previously unknown to me were discovered in this manner.



ABSTRACTS OF PAPERS PRESENTED AT THE 49TH
ANNUAL MEETING OF THE ASSOCIATION,
CLEVELAND, OHIO, MARCH 30-APRIL 2, 1953

JOHN W. ALEXANDER—*The Basic-Nonbasic Concept of Urban Economic Function.*

For at least thirty years students of urban areas have recognized that, in theory, the economic activity of a city could be divided into two components: that which met demands originating outside the city, and that which met demands from the city's own inhabitants. Homer Hoyt identified the former as "basic" because they bring money into the city, thereby comprising the basis of the city's life; he suggests the term "nonbasic" for the second type.

Although this concept has true geographic quality, based on a specific space-relationship (that with regions of demand), it has not been applied by geographers in very many urban studies. This paper endeavors to show its advantages over the traditional methods of approach and to urge its application in more urban studies. Resulting benefits should be: 1) an improved methodology for measuring the basic and nonbasic components of urban economies; and 2) a more meaningful type of analysis because a) activities will be classified according to a specific space relationship, b) the "Basic-Nonbasic Ratio" will be available for the comparative study of cities, c) it will be possible to have an unobstructed view of the activities which bind a city to its region, and d) it will enable a classification of cities based on an accurate measurement of one type of regional function.

LEWIS M. ALEXANDER—*Problems along the Israeli-Arab Boundary.*

One of the greatest obstacles to peace in the Middle East is the continued friction between the Jews and the Arabs. This friction is reflected in the problems which exist along the boundaries separating the two peoples from one another.

Israel's borders were laid down in the winter and spring of 1949. In the North the pre-war boundaries with Lebanon and Syria were adhered to, although in the northeast a demilitarized zone was set up in the Jewish areas which had been occupied by Syrian forces during the war. In the east 2300 square miles of former Palestine territory were annexed by Jordan. Agricultural communities were split by the frontier, highways were cut, and Jerusalem itself was divided into two sectors. In the Negeb Israel retained all of the former Palestine land with the exception of an Egyptian-held strip along the Mediterranean coast. To the south of this is another demilitarized zone, formerly occupied by Egyptian forces.

The superposition of a closed frontier on what used to be an economic and political unit has caused extreme hardship to the peoples of the area. Jewish exclaves and projections into Arab territory, Arab control of Jewish and Christian Holy places, and the course of the Jordan River through first Arab, then Jewish, then again Arab territory, have all accentuated the difficulties of the present boundary arrangement. In the absence of peaceful relations between Israel and her neighbors

the winding boundary will continue to be a source of tension between the two peoples.

ALBERT G. BALLERT—*The Ports and Lake Trade of Georgian Bay.*

The Georgian Bay area, widely known for its recreation and scenic values, is also important in the commerce of the Great Lakes. The Bay area is sufficiently large and separated from Lake Huron so that it may be considered a sixth member of the Great Lakes chain.

In a diversity of settings, seven ports handle practically all of the lake trade of Georgian Bay. Each is primarily a receiving port and all or a large proportion of the receipts are transhipped by rail.

The four ports along the southern shores of the Bay—Owen Sound, Collingwood, Midland, and Port McNicoll—are principally grain receivers. Their position is favorable in the movement of grain from the head of the Lakes to ocean ports on the lower St. Lawrence. Development of the Seaway project may, however, drastically affect the route via Georgian Bay. In 1951 nearly a third of the 315 million bushels of grain shipped from Fort William—Port Arthur followed this route. The figure for wheat was 38 per cent. At present no American grain, except a minor amount of corn, is received.

At the three northern ports—Parry Sound, Britt, and Little Current—coal and petroleum products account for all or most of the receipts. The railroads and interior settlements are the chief destinations of these commodities.

The statistical basis for this paper is believed to be the first prepared which includes essentially all of the lake commerce of the Georgian Bay ports.

GEORGE BEISHLAC—*Changes in Land Use in Southeast Puerto Rico from 1500 to 1951.*

Southeast Puerto Rico is a 300 mile-square region made up of parts of three geographic regions; a Semi-Arid Alluvial Plain, a Semi-Arid Upland, and a Humid Upland.

Before the Spanish settled the region, it was mostly in natural vegetation with mangrove forest along the shore, savanna forest in the semi-arid areas, and rain forest in the Humid Upland.

Maps of land use for 1500, 1776, 1897, and 1951 show the changes in land use that took place up to 1951 when irrigated sugar cane grew on the Semi-Arid Alluvial Plain, grazing and food crops dominated the Semi-Arid Upland, and coffee and food crops occupied the Humid Upland. The mangrove forest is the only natural vegetation that has remained largely unchanged.

Since 1500 there has been a shift from a self-sufficient economy to an export economy based largely on one product, sugar.

The main influences that have brought about the changes in land use are: the increase and change in composition of the population; the introduction of new plants and animals; the development of transportation, irrigation, and large scale sugar milling; and the governmental policies of the Spanish and the Americans.

Eight map slides and four Kodachromes illustrate the foregoing.

J. BRIAN BIRD—*Postglacial Marine Submergence in Central Arctic Canada.*

The adjacent seas transgressed almost all the coast of Canada at the close of the last glaciation. Nowhere was submergence greater than in the central Arctic, where Hudson Bay extended 400 miles west of its present position, over Keewatin and eastern Mackenzie districts. During three summers' field work on the west and north sides of Hudson Bay, data relating to the maximum extent of this sea, the present elevation of the marine deposits, and the form of the crustal recovery were obtained. Evidence shows that in the west of the area, in the Thelon and Dubawnt River basins, the land was submerged beneath a great proglacial lake which was succeeded by the sea; in eastern Keewatin the sea invaded the land to the present 360–400 foot contour lines; and on the islands north of Hudson Bay the sea reached the 550–650 foot contour lines. These differences are believed to be due to the retreat of the ice sheet from some areas before others.

After the retreat of the ice the recovery of the crust was at first continuous, but during the final 100 feet of uplift, there have been two periods of temporary stability, the lower of which coincided with a period of greater warmth than today. In some parts the land has risen at least 80 feet since the earliest Eskimos occupied the region. There is evidence that uplift is still continuing.

In the areas that were submerged, the landscape has experienced widespread temporary and small-scale modification. Marine and glacial deposits have been reworked into beaches, spits, bars, and other shore features that are in places hundreds of feet above present sea level. Erosional forms in consolidated material are on the other hand rare.

DAVID I. BLUMENSTOCK—*The Reliability Factor in the Drawing of Isarithms.*

The question often arises as to how much generalization should be employed in the drawing of isarithms. Where the data are not wholly reliable and the degree of unreliability can be calculated or estimated, it is possible to determine approximately how closely the isarithms should fit the plotted data.

Suppose, for example, it is desired to draw an isarithmic map showing mean July temperatures in Kansas, the map being based on a 25-year record. There are three principal sources of unreliability in the data for such a map: 1) observational error; 2) sampling error; and 3) bias or persistent error. The bias, associated with the method of calculating mean daily temperatures, can be compensated for directly by adjusting the plotted values by the mean amount of bias. Observational and sampling error can be combined in one standard error expression, which can then be applied to determine from Standard Normal Curve tables how many of the plotted values can be expected to fall outside their proper isarithmic intervals as a result of unreliability. By drawing trial isotherms and counting the values that are improperly placed in a strict isarithmic sense, isotherms can be arrived at that display the proper magnitude of generalization.

The method is generally applicable to the drawing of isarithmic maps based on data that are not wholly reliable where the error factors follow a normal, Gaussian, distribution.

DONALD J. BOGUE—*The Geography of Recent Population Trends in the United States.*

In addition to keeping informed about the most recent changes in size, growth rates, and composition of the nation's population, geographers are also concerned about the environmental location of those changes. This paper reviews the major population changes which occurred between 1940 and 1950, in terms of the region and urban-rural location of their occurrence.

WESLEY CALEF—*Weather Types as a Method of Analysis and Description of Climate.*

The unsystematic study of weather types is almost as old as the science of climatology itself. Many geographers have contributed fragments to our knowledge of weather types and numerous climatological treatises have described some weather types characteristic of various climatic regions.

The fundamental difficulty in the use of weather types lies in the initial problem of setting up a satisfactory classification. Since no two sequences of weather ever have precisely the same succession of meteorological events, a method must be found of combining and separating these events (varying in greater or lesser degree) into useful and meaningful classes or types.

In general, three bases for the delineation of weather types or classes have been used. These are: 1) a similarity of sequence or change in one or several meteorological elements; 2) similarity of barometric pressure patterns; and 3) similar patterns and/or sequences of air mass changes and modifications.

None of these methods has proved entirely satisfactory. Quite similar pressure patterns produce widely dissimilar weather sequences. The same is true of air mass patterns. Little has been done with the first method.

The methods, difficulties, and results of weather type research are illustrated from the literature.

CHARLES W. CARLSTON—*Irrigation Practices in the Quetta-Pishin District of Baluchistan, Pakistan.*

The Quetta-Pishin district of Baluchistan, with a 6 to 10 inch average annual rainfall, must use irrigation water to grow its cash and subsistence crops. Irrigation water is obtained from river perennial flow and flood flow, karezes, springs, and dug wells pumped by Persian wheels worked by camels. Use and sharing of such water is governed by Moslem water laws and tribal custom. Map views copied from aerial photographs illustrate methods of trapping alluvial fan floods and river foods. A map of a system of karezes is also discussed. Practices of sharing irrigation water are as follows. The total flow of water is divided into shares allotted to the parties owning portions of the water. The unit of measurement of shares is the total flow per 24 hours, known as a *Shabana Doz*. An example of water sharing is given through a discussion of the division of the perennial flow of the Surkhab River among five villages and the Government of Baluchistan.

ANDREW H. CLARK—*Geographers Are Where You Find Them: Titus Smith of Nova Scotia, 1768-1850.*

Geographers of great competence often turned up unexpectedly under strange incognitos and in strange places. In no work is such a discovery more welcome than in the field of historical geography in which we must depend on other, and often very poorly focused, eyes for our views of an area. In research on the historical geography of Nova Scotia a man of unusual ability and accomplishment, Titus Smith junior, has greatly aided by his reports, the understanding of the area in his day. A most competent industrious and thoughtful observer he deserves to be ranked as a great geographer of his time. Smith's most important work was his survey of the resources and land-use of the interior of the colony in 1801 and 1802 when the population still clustered close to the coasts and when there was every sort of opinion, but very little clear evidence, as to what the interior contained.

A large part of Smith's journal, and the map locating each day's travel on his tours, which extended over more than six months in the field, have long been misplaced or lost. Recently come to light, the map has been transferred to an accurate modern base as well as may be, and is here exhibited.

Extracts from the journals show the quality of Smith's work although he had many other accomplishments and publications. The discovery for geographers of an involuntary and unwitting, but most distinguished member of their profession, in the Nova Scotia of a century and a half ago emphasizes once again that "geographers are where you find them."

SAUL B. COHEN—*The New and Old in the Agricultural Pattern of Israel.*

For centuries man lived on the low, mountainous, limestone region of Palestine known as Mount Carmel. Grazing and viniculture provided the economic base for the village, and the lowlands adjacent to the Carmel served as auxiliary pasture lands. Isfiya, a Druze village, utilizes its land in a manner closely connected with the above pattern.

A modern settlement, however, must intensify its land use and diversify its economy if it is to find a home on the Carmel. Beth Oren, a Jewish settlement, is such an expression of the impact of western civilization upon the Carmel.

This paper compares the two settlements. Color slides taken by the author during the summer of 1952 illustrate the main points.

JOHN WESLEY COULTER—*Human Geography and Physical Geography.*

The author of "The Position of Physical Geography among the Sciences at Northwestern University," in the *Journal of Geography* for November 1952, asks for comments. Human geography, the relation of man to habitat, is a science of human collectivities in their spatial framework; it is a social science. Physical geography, like other natural sciences, comprises a complex group of fields of knowledge including geomorphology. If physical geography is taught in the same department with human geography, each should be taught by a scholar in his field. The student of human geography gains in two ways by sound training in the field of

geomorphology. He becomes well acquainted with the surface features of the earth and learns something of the method of science from a scholarly natural scientist. We cannot maintain a high standard of scholarship in human geography if we permit courses to be taught by people who have had "little or no training" in the subject matter of their course. Physical geography, wherever it is taught in a university, must justify itself as a natural science and be treated according to its own data and methodology. Human geography demands as much knowledge of the natural environment as of humanity.

GEORGE B. CRESSEY—*Changing the Map of the Soviet Union.*

The Fifth Five Year Plan, 1950–1955, provides for major engineering projects which will materially change the map of the Soviet Union. Navigable canals will link the lower Volga with the Don near Stalingrad, provide better connections between the upper Volga and the Baltic, and join the Caspian Sea with the Amu Darya. Two dozen river and sea ports are to have their harbor facilities doubled. Most of them lie in the Volga basin.

Irrigation water is to be supplied to several million acres, chiefly in the lower Volga area. Other projects lie in the southern Ukraine, near the Emba, and in the Turkmenian Republic. Extensive swamp drainage is planned for the Byelorussian marshes near the Polish frontier. To increase agricultural production further, thousands of miles of shelter belts are in process of development on 15 million acres in the European steppes. These are designed to ameliorate the climate in an area 1,400 miles wide and 800 miles from north to south.

Hydroelectric power is scheduled for a major expansion. The Kuibyshev Dam on the Volga, comparable to the dam at Grand Coulee, is to be completed by 1955. Another dam, equally large, is to be built at Stalingrad. Two dozen other dams are included in the Fifth Five Year Plan.

Only modest railway plans have been announced. Unlike the projects previously listed which lie largely within Soviet Europe, the new rail lines are in Siberia and Middle Asia.

The achievements of the previous Five Year Plans and the proposals of the Fifth materially change the map of the Soviet Union. The country is in the midst of impressive pioneering developments, but it does not seem likely that the U.S.S.R. can ever achieve Premier Stalin's goal "to overtake and surpass the capitalist world."

HAROLD F. CREVELING—*Mapping Cultural Groups in an American Industrial City.*

Industrial cities contain numerous peoples of diverse cultural backgrounds. Many of the social groups have settled in homogeneous neighborhoods somewhat apart from others. Students of urban geography, among others, have been interested in the distribution of these peoples within certain areas. Little mapping of cultural groups has been done because of a lack of statistical information. This paper presents a method, developed in Worcester, Massachusetts, which provides a practical way of locating the pattern of such groups.

"Cultural group," as defined, consists of people having to some degree common social characteristics, habits, customs, and traditions. Also, group consciousness among members of the social unit is a characteristic.

Census data alone are insufficient as a basis for a cultural map because they are limited to foreign-born groups and do not distinguish between peoples such as Negroes, Yankees, and Jews. Even census data for the foreign-born are unavailable for small geographic units within cities having no census tracts. Hence, sample interviews taken at regularly spaced intervals were used to supply information for constructing the Cultural Pattern Map.

Checks to test the results of resident interviewing included: mail carriers interviews; the location of churches and clubs whose members, mainly, belong to one cultural group; and conferences with members of agencies working with the public.

An interpretation of the cultural group pattern was made by comparing group locations with physical, cultural, and economic features of the city. Factors influencing the location of various groups were evaluated and the dominant ones noted.

RAYMOND E. CRIST—*Bases of Instability in the Near East.*

Both physical and cultural factors have made for continuous ferment of peoples in the Near East. Periodically nomads have come off the desert, driven by drought, to raid the settled agriculturalists of the villages, who in turn migrated to the few large cities or to areas overseas.

Divers peoples overran the Near East and all made deposits of varying thicknesses there of the elements both of their material and of their non-material culture. By the sixth century the once brilliant Byzantine Empire was rotting at the core, and the overtaxed peasantry of the eastern Mediterranean accepted the religion of Mohammed *en masse*. The Moslem world of the Near East was held in thrall by the Ottoman Turks from 1516 to 1918, when it was "compartmentalized" by the Allied Powers. The "National" states since 1918 have largely ignored the countryside, except to collect taxes, and the peasants have ignored the State. The peasant and the rich city dweller live in entirely different worlds. Further, religious animosities are bitter, and they use up—destructively—a reservoir of energy that could be used to better advantage in productive channels. The intense nationalism which seems to be aroused against the Westerners has religious overtones, but is in large measure a protest against the crushing poverty of all classes, and particularly of the peasants.

In order to achieve the fruitful cooperation of the Near Eastern peoples, the United States must win the friendship and good will of those engaged in agriculture, for they form from 80 to 90 per cent of the population. Whoever wins the hearts of the peasants may guide the destiny of the Arab states. Whoever controls the Arab countries may dictate policy in the Near East.

MILDRED DANKLEFSEN—*Recent Trends in the Sugar Industry of Jamaica.*

The noteworthy increase in sugar production in Jamaica in recent years has been the result of modernization in both field and factory techniques.

The sugar industry has long been adjusted to the physical factors of terrain,

climate, and soils, but highest yields and largest production in the island's history have been made possible by overcoming in part the handicaps of the environment. The irrigation of large tracts of the semi-arid, south coastal plains and application of new soil techniques for greater returns on fertilizer expenditures are part and parcel of modern trends in the industry.

A sizable production of cane now comes from peasant farmers who grow it as a cash crop and haul the harvested cane to sugar factories on estates. The large increase in the number of owner-operated farms in the past decade has been possible through the government sponsored, land settlement program.

A favorable development in the past one and a half decades has been the use of new cane varieties not only to overcome the incidence of mosaic disease of cane leaves, but to raise the yield of sugar per acre. The varieties are sufficient in number to suit the varying rainfall and soil conditions in the humid Blue Mountain valleys, in both wet and dry inland basins and river lowlands of the plateau, and in the dry coastal plains.

Marked shifts in cane production have also taken place. Most of the traditional eighteenth and nineteenth century sugar areas have declined while irrigated coastal plains have shown a phenomenal increase.

The sale of sugar to the British Ministry of Food under contract in the past decade or so has assured favorable prices in a stable market for Jamaica's most important industry.

RICHARD L. DAY—*Geographic Distribution of Wildlife in Maine.*

An analysis of the number of species of wild vertebrate animals regularly occupying various portion of the State of Maine reveals that, contrary to ordinary expectations, there is an actual increase of about 10 per cent in the number of kinds of mammals, breeding birds, and fresh water fishes to the northward. Reptiles, on the other hand, show a 40 per cent drop in number of species in the same direction, and amphibians decrease slightly.

A study of the distribution of wildlife according to the ten principal classes of habitat found in Maine suggests that the relatively undisturbed Great Northern Forest which occupies much of the northern two-thirds of the state has served as a kind of sanctuary for many species of animals. Fresh water streams, lakes and marshes, and their vicinities support the largest variety of vertebrate animals, while upper mountain slopes have the smallest selection.

Since his arrival on the scene, white man has become the prime geographic factor influencing the distribution and quantity of Maine's wildlife. Approximately as many new species have entered the state as have disappeared—all as a result of man's activities. The tendency was for an accelerating decrease in the numbers of many wild animals until the 20th century's opening, at which time an aroused people caused sufficient conservation measures to be put into effect to reverse the general trend.

Today recovery of many species is continuing, although certain trends in land utilization, forest management, and changing natural balances are bringing losses to some animals.

DAVID J. DE LAUBENFELS—*The Nature and Boundaries of the Corn Belt.*

The term "Corn Belt" is of common usage. Yet, a clear concept of the nature of this region and a definite boundary for it are lacking in the literature. By use of county agricultural statistics for 1940 and 1945 an attempt to determine the nature and boundaries of the "Corn Belt" was made. The literature was examined to discover what has been written on the subject. Some of the qualities mentioned for the "Corn Belt," such as corn being the most important crop, were found to apply to neighboring areas as well. Only when the concept of intensity was introduced was it possible to produce regions which corresponded to the area usually understood to be the "Corn Belt." In this manner the "Corn Belt" was found to be characterized by heavy corn production, a large proportion of the area devoted to corn, intensive livestock or cash corn production, and superior agricultural land. Boundaries were drawn where these characteristics gave way to other characteristics; in the north, where livestock farming became less important than dairy farming; in the west, where corn acreage became less than wheat acreage; and in the south and west, where cropland planted became less than 40 per cent of the total area. In general sharp boundaries were found. The "Corn Belt" is a region of superior agricultural land devoted to commercial livestock and cash corn.

KNOWLES DICKEY—*Steel for Peru.*

There is being constructed at the port of Chimbote, under the direction of the Corporación Peruana del Santa, a small integrated steel plant. The industry will consist of two electric pig iron furnaces, two electric steel melting furnaces, and rolling mills. Ingot steel production will be about 65,000 metric tons per year and the rolling mills are designed to produce about 55,000 metric tons of finished products annually.

Corporación Peruana del Santa is an agency of the Peruvian Government and was established in 1943. It recently underwent a reorganization. The negotiations of the Corporation with European interests to promote a steel industry in Peru culminated in the signing of several contracts in 1951, by which part of the plant was financed.

The plant will utilize iron ore from the Marcona deposits. These deposits are on the coast about 500 miles south of Chimbote. Coal for the production of the pig iron will come by railroad from the Santa fields, a short distance from the plant. Cheap electrical power, which is essential to the economic operation of the enterprise, is to be available from a new hydroelectric plant located on the Santa River, inland from Chimbote.

The production of the plant is expected to be entirely absorbed by the domestic market and at prices competitive with imports of similar products.

The plant will provide Peru with an assured supply of iron and steel products, will increase employment, and will contribute to the economic development of the country.

ROBERT E. DICKINSON—*Land Reform in Southern Italy.*

Land reform laws became effective during 1950 in selected depressed areas in

Italy. Most of the areas are in the south and the program is most advanced in the areas of northern Calabria and Puglia-Lucania.

The purposes of the reform are as follows: 1) to expropriate large underdeveloped properties; 2) to distribute such expropriated land primarily among a) landless agricultural laborers, and b) agricultural families without adequate land to support them; 3) to provide capital equipment and technical assistance to such families; 4) to ensure that the holdings provided have a size and economy adequate a) to maintain full employment for the family labor available, and b) to provide an adequate standard of living; 5) to intensify production by a) grain-grass rotations and the keeping of one or two cows and calves, and b) vine-olives and, where physical conditions are appropriate, crops such as beets, cotton, tobacco, citrus, and vegetables.

The law as it stands will affect 700,000 hectares in all Italy, of which a half is in southern continental Italy. The main irrigation projects under construction are also within the selected areas. The district associations of proprietors within the areas are also legally obligated to effect land improvements with State aid.

This land reform program will put just over 100,000 families on new holdings in all Italy, and about 40,000 families in southern continental Italy. It will also involve others in services, as in the new settlement (*borghi*). Probably 500,000 people will thus be affected in all. This is only a part of the total ten-year program for southern Italy for the improvement of living conditions and resource development. If coupled with the development of industry and emigration, it should go far toward solving the population problem of the southern part of the country.

SIGISMOND DER. DIETRICH—*Rainfall in Miami, Florida 1914-1951.*

There are a number of classifications of the climate of southeastern Florida which, though based upon somewhat varying criteria, all seem to agree that it is a tropical, rainy climate, with a maximum precipitation during September and October ascribed partially to hurricanes. Due to the implications beyond the purely climatological, there seemed a need for reexamination from two points of view. First, how true are the average rainfall data, not in the mathematical sense, but to what extent do they represent the actual conditions. Second, if hurricanes have a pronounced effect upon the average distribution of rainfall, then would it not be advisable to work out an "adjusted" average from which the hurricane rains have been removed, thus producing an average more truly representing the actual conditions?

Examining the rainfall pattern of the 1914-1951 period with a maximum of 84.38 and a minimum of 28.66 inches annual precipitation, it can definitely be stated that though there is ample rainfall in Miami on the average, Miami is more often subject to inadequate rainfall than not due to its distribution and variability and to edaphic and topographic conditions.

The hurricanes, though important and undeniably recurrent features of Miami's climate, exert little decisive effect either upon the average annual amount of precipitation or upon the fall maximum of precipitation. Thunderstorms (with 1.5 inches of rain and more) are the key to distribution of rainfall in Miami.

It appears necessary to correct the inferences of classifications of Miami's climate. Further study is needed along these lines, especially with reference to thunderstorm activities.

DONALD K. DOHERTY—*The Ten Largest Cities of Canada and Their Metropolitan Areas.*

The 1951 census shows that the ten largest Canadian cities—Montreal, Toronto, Vancouver, Winnipeg, Hamilton, Ottawa, Quebec, Edmonton, Calgary, and Windsor—each have more than 100,000 inhabitants. For the first time the largest, Montreal, has a population of over 1,000,000. Location reflects the continued predominance of the Provinces of Ontario and Quebec in the national population picture. New additions to the 100,000 category, Edmonton and Calgary, have reached this status as part of the post-war boom in Alberta.

Each city has its metropolitan area. There are two metropolitan areas of over 1,000,000—Montreal and Toronto. Vancouver is over 500,000. All the others have more than 130,000, but less than 400,000. Suburban dwellers form large fractions of the population in Toronto, Vancouver, Winnipeg, and Quebec especially. In Edmonton and Calgary, the large municipal area has held satellite residents to less than 8 per cent.

Due to recent settlement and eastern industrial control Winnipeg, Edmonton, Calgary, and Vancouver contain high fractions of their respective provincial urban populations. There are few cities except the large ones in provinces west of Ontario. The growth of the metropolitan area accentuates this situation.

City populations, generally, have increased at a decreasing rate since 1901. During the last census decade the majority increased more rapidly in keeping with the national expansion. In two exceptions, Toronto and Windsor, the suburban growth offset decline in the central city. The last decade shows Canadians to be turning toward suburban living, and the metropolitan areas have increased more rapidly than the cities proper.

FRED E. DOHRS—*Geopolitical Aspects of a United Europe.*

In World War I as well as in World War II, the United States went to war to prevent the unification of Europe. Despite this, it is widely believed in the United States that the unification of Europe would solve many of the problems of recurring wars in the world. The national state unit will be a geopolitical fact for some time to come despite efforts toward world collective security. In the world power situation, the United States, fronting on two oceans, has control of the seas of the world as an American Lake. Her interests in Europe are the same as Britain's—the maintenance of a balance of power on the continent. American policy toward the Soviet Union is not one of annihilation, but rather a reduction of relative power. Following this reduction, however achieved, a United Europe, including all nations of the continent except Russia, would be a possibility. United Europe would then have a population of approximately 340 millions, and a productive capacity second only to the United States. There is no reason to assume that United Europe, however democratic, would be friendly to the United States, but rather the opposite.

Thus united, Europe would not necessarily be a serious threat to a British-American alliance, but if the overseas colonies of the continental nations joined with United Europe (as well they might), this would mean preponderant power. Therefore, until collective world organization and security can be achieved, the interests of the United States are best served by preventing the unification of Europe.

ROGER E. ERVIN—*Industry in the Concepción Area of Chile.*

Concepción is the growing industrial center of Chile. The area has long ranked third in industrial development and has had a disproportionate share of the country's large industries. Concepción has many advantages which make it a preferred location for industry. Among these are proximity to coal, hydro-electric power, fresh water, comparatively good transportation, a coastal location near the latitudinal center of the country, a large extent of flat land, a moderate climate, and the city which offers many services that make settlement attractive.

The handicaps to industrial growth are common to the country as a whole. Included are a shortage of capital, a small domestic market, transportation problems, and a lack of skilled labor.

The Fomento Corporation has been instrumental in developing and aiding the industrial growth of Concepción and the country during the past thirteen years.

Coal mining is the basic industry and the area supplies eighty per cent of the country's coal from two large mines and a small lignite mine. The most recent industry and the one that promises to accelerate the industrial growth is the Huachipato iron and steel mill which started operations in mid-1950. The textile industry has long been associated with Concepción. The area boasts six woolen mills and the largest cotton mill in the country. The ceramics industry consists of two factories, one of which is among the world's largest and most modern. Food processing includes the second largest sugar refinery in the country, a flour mill, and several small fish-processing plants. A timber industry based on plantation grown Insignis pine is beginning.

With coal, an iron and steel industry, forest and fisheries resources, and advantages of site and position, the future of industry in Concepción is indeed promising.

ERIC H. FAIGLE—*Basic Pattern Relationships in New York State.*

Each state of the United States has its own arrangement of surface features upon and to which the events of history are related. The arrangement of surface features in New York State is not unique in this respect. In character and arrangement these features have provided a stage upon which the various acts of history have taken place.

The development of past and present cultural features of New York State show a relationship to such major physical features as the Allegheny Plateau; the Adirondack and Catskill Mountains; the Champlain, St. Lawrence, and the Hudson-Mohawk Lowlands. The character and arrangement and the effects of glaciation coupled with great river systems show a direct relationship to the present day cultural patterns.

ROBERT W. FINLEY—*Distribution Patterns of the Natural Vegetation of Wisconsin.*

The new map of the natural vegetation of Wisconsin, presented with this paper, gives enough detail to allow some interpretations concerning the origins of the distribution patterns. The original vegetation cover consisted of four major formations, each of which was a small segment of a more extensive unit within continental North America. The distribution of these formations in Wisconsin is largely explained in terms of response to fluctuating climates of the postglacial period. Local environmental conditions were effective to some extent in shaping the distributions. As a result of the interaction of the factors involved, the broad pattern consisted of a deciduous forest with intermingled areas of grassland in the south, and a mixed coniferous-deciduous forest plus small areas of transitional boreal forests in the north.

Contained within the matrix of this broad pattern there was in the east and in the north a more detailed pattern of interrelated plant communities which graded from one to another through orderly transitions, apparently in response to contemporary climate. Interruptions were caused by local site factors or by catastrophe. In contrast, in the south and southwest there was a significant lack of order in the distribution of plant communities, a seemingly haphazard scattering which can be explained only in terms of the postglacial vegetational history of the area.

WILLIAM L. GARRISON—*Remoteness and the Passenger Utilization of Air Transportation.*

The theory of transfer media utilization is examined and a hypothesis evolved for the purpose of determining the space factor in the pattern of passenger utilization of air transportation in the United States. The hypothesis is that the greater the remoteness the greater is the utilization of air transportation. Broadly, the degree of remoteness is regarded as the degree of population dispersion.

An experiment was designed for the test of the hypothesis. Three quantifications of remoteness were adopted—a population potential measure, a density of population measure, and a distance from center of population measure. The degree of air transportation utilization was quantified in two ways—a number of passengers enplaned measure and an average length of trip measure.

A sample area incorporating the airports (and their immediate tributary areas) between New York and Los Angeles was selected. The quantified factors of utilization and remoteness were compared on scatter diagrams for this sample area.

The experiment failed to verify the hypothesis. However, a number of uncontrolled factors, like defects in the transportation data, were present in the experiment preventing the complete rejection of the hypothesis.

HOWARD L. GREEN—*The Geographic Use of Point-to-point Telephone-call Data.*

This paper discusses the use of telephone-call data for measuring the "community of interest" between settlements.

Most regional telephone companies compute the number of place-to-place conversations on a sample basis for settlements in their area. To illustrate the use of

such information, a map indicating the boundary between the New York City and Boston hinterlands in southern New England is presented. The telephone boundary differs somewhat from a composite boundary drawn from the results of seven different functional measures. The variation between the two boundaries is due in part to the cost involved in making long-distance telephone calls.

While the cost factor and the different sample study periods used by the various telephone companies are weaknesses, there are real advantages to using this measure. The advantages are: 1) that telephone-call information is computed for a large number of settlements; and 2) that this measure has fewer disadvantages than any the author has employed.

Telephone-call data could offer researchers an empirical basis upon which to build a hierarchical pattern of towns and their hinterlands, much as Christaller attempted in Germany. Additional research may indicate that this information could also be an aid in furthering refining the limits of standard metropolitan areas.

W. M. GREGORY—*Growth of Cleveland's Suburbs.*

Cleveland grew rapidly in the period, 1860–1930; its area was enlarged by annexations. Its external transportation was dependent upon the Great Lakes and the Cuyahoga River. The completion of the Ohio-Erie Canal gave access and focused upon Cleveland the trade of the interior of the state. The railroads coming in 1853 gave east and west land transportation that aided the city's growth.

The suburbs about the perimeter of Cleveland began their most rapid growth in 1920 and the automobile was the agent that made the nearby land readily accessible. The suburbs had their greatest growth in the 1920–1930's. Four of the suburbs have a population of over forty thousand. Many smaller suburbs make the total forty-three at the present time (1952). Some suburbs are purely residential, while some of the newer ones are grouped about the industrial establishments.

W. M. GREGORY—*The Formation of Tawas Point in Lake Huron.*

Tawas Point on the west shore of Lake Huron is a point in Tawas Bay about 60 miles north of Bay City. A lighthouse was built on Tawas Point in 1856 and twenty years later (1876) the light was moved 1800 feet to the southwest. In these twenty years, about 60,000 square feet of area or about 90 feet in length were added annually. In 1900, a fog horn was built 3,168 feet to the southwest of the 1876 lighthouse; 134 feet in length was added annually in this period. The average growth of Tawas Point has thus been 112 feet per year.

If the distance from the tip of Tawas Point (the present fog horn) to Nipissing Beach is taken as 33,600 feet, this is the present length of the point. If the growth of Tawas Point has been 112 feet per year, then the point is approximately 300 years old. The Nipissing glacial lakes were present at approximately the beginning of the growth of Tawas Point.

VASYL GVOSDETSKY AND H. BOWMAN HAWKES—*Reappraisal of the History of Lake Bonneville.*

The shore features of Pleistocene Lake Bonneville have attracted the attention

of geologists for about three-fourths of a century. Gilbert's original interpretation expressed an important principle, namely, that the history of the lake was contemporaneous with the whole of Pleistocene time. When he wrote his classic monograph in 1890 the Pleistocene was recognized as bipartite, that is, of two glacial ages and one interglacial stage. This principle of duality was projected by Gilbert into the history of the ancient lake. More recently the study of the Pleistocene revealed four glacial ages and three interglacial stages; consequently, the history of Pleistocene became four-partite, but the history of Lake Bonneville remained unchanged or bipartite. The recognition of the four phases of the Pleistocene necessitated the abandonment of the idea of the contemporaneity of the entire history of the lake with the whole glacial period. It was necessary to shift the lake's history into the second part of the Pleistocene with Illinoian and Wisconsin subdivisions, an interpretation that is widely accepted today. The purpose of this paper is to reappraise this concept of Lake Bonneville. The evidence of well log data taken from Lake Bonneville sediments correlates with the observable four shore features and is corroborated by the present day concept of a four-fold Pleistocene period. Thus it is proposed that the high water stages of Lake Bonneville encompasses the entire Pleistocene, as Gilbert postulated, and may be synchronized with the glacial ages as follows: 1) Pre-Bonneville—Nebraskan, 2) Bonneville—Kansan, 3) Provo—Illinoian, and 4) Stansbury—Wisconsin.

WILLIAM A. HANCE—*The Gezira Scheme in the Anglo-Egyptian Sudan: an Example in the Development of Less-Developed Areas.*

The Gezira Scheme in the Anglo-Egyptian Sudan operates under concepts that make it important as an example in the development of less-developed areas. This scheme is an organized irrigation operation in the gently sloping clay plain between the Blue and White Niles south of Khartoum. About half a million acres are irrigated each year by Blue Nile waters led by gravity from Sennar Dam and applied by day to the individual fields. Long staple cotton is the commercial crop; dura and lubia, the major food and fodder crops. The Gezira provides full support to 450,000 people and seasonal support to an additional 150,000. Profits from the cotton crop provide over half the revenue of the Sudan Government and give the tenants one of the highest standards of living of any peasants in the Middle East or Africa. Cotton and cotton seed from the Gezira comprise about 58 per cent of the exports by value of the Sudan. Part of the success of the scheme must be attributed to the favorable physical features of its site: the ecological suitability of high-value cotton, the gently sloping topography, the excellent clay soil, and the dead period during the dry season. The conceptions under which it operates, however, are the elements that are of significance to other development schemes. These are scientific approach and application, direction by an independent managing board, partnership arrangements, and a social awareness. Application of the first two concepts has permitted rapid and widespread utilization of the best known techniques, while the last two have removed the scheme from the criticism of imperialism and colonial exploitation.

CHAUNCY D. HARRIS—*Market Potential as a Factor in Industrial Location in the United States.*

Costs of assembling raw materials, of processing, and of distributing to markets are all important factors in the localization of industry. Geographers have contributed heavily to studies of raw material sources, to raw-material-oriented industries, and to simple basic industries. It is time for deeper geographic penetration into the role of the market in industrial localization, particularly for complex assembly industries. The size and quality of the market may very well be the most important single factor in the general distribution of manufacturing in the United States.

This paper proposes a method of measuring market potential by the summation of the estimated market for specific products by small areal units divided by the actual transportation costs to these areas from specific points. A generalized market potential analysis is based on market measured by retail sales per county divided by transport costs of reaching that county from selected points. It is postulated that retail sales are a better measure of potential market than is population. Estimated transport costs to deliver a ton of manufactured goods from factory to market range from \$6 for local truck delivery to about \$60 for transcontinental hauls (including terminal and delivery charges). On the basis of these calculations an axis of maximum market potential is recognized; it runs through the heart of the manufacturing belt extending from New York city on the east to Chicago on the west. It passes through Philadelphia, Baltimore, Pittsburgh, Cleveland, and Detroit. The very growth of manufacturing and urbanism in the manufacturing belt tends to accentuate the locational advantage of the belt for manufacturing. This advantage lies both in the increase of the market and in the rise of factories supplying components for assembly manufacturing.

JOHN FRASER HART—*The Turks and Medieval Trade: A Fallacious Explanation of the Cause of the Age of Discovery.*

Great voyages of discovery were made by Spanish and Portuguese explorers in the late fifteenth and early sixteenth centuries. The historical coincidence of widespread Turkish conquests in the Near East has led to the fallacious assumption that the Age of Discovery resulted primarily from the blocking of Levantine trade routes by the conquests of the Turks. Examination of the historical geography of the Near East reveals, however, that the Turks, far from desiring to close the trade routes, actually contributed to a futile effort to open them.

The caravan routes through Central Asia carried no appreciable volume of trade after the disintegration of the Mongol Empire about 1340. Between 1340 and 1504 virtually all oriental commodities moved across the Arabian Gulf, up the Red Sea to Suez, across the Egyptian desert to the Nile, and downstream to Alexandria, whence they were taken to European ports by Venetian traders. The abrupt decline of trade along this route after 1504 was not due to Turkish conquests, as the Turkish Empire of that date extended only about as far as the southern boundary of modern Turkey.

The closing of the Red Sea route was a calculated move of Portuguese policy. The Portuguese, who coveted a monopoly of the oriental trade, maintained a systematic blockade of the Red Sea after 1504 to establish and preserve their monopoly. It is obvious, therefore, that the cutting of the trade routes was not a causative factor in early Spanish or Portuguese explorations; some other, presumably more complex, explanation must be sought by historical geographers.

JOHN FRASER HART AND EUGENE COTTON MATHER—*The Chorographic Compage Map.*

Geographers have frequent need of some adequate cartographic medium for the presentation of a variety of statistical information on a single map in such fashion that areal relations are quickly and readily apparent. The paucity of maps of the Southeastern United States which were deemed adequate for the International Geographical Union Tour of the region necessitated the development of the chorographic compage map.

Statistical information for selected, representative areas only is presented in graphs and diagrams ranged around the edges of the map, since it is simpler to refer to a single map portraying a variety of related information for each selected county than to refer to a number of different maps in order to obtain data for that county. A series of comprehensive maps of the Southeast would have proven unmanageable in the field, whereas the selected data on the single map were readily absorbed and utilized when studied in their actual areal relationships.

The success of this technique with professional geographers from abroad has proven its worth as a medium of cartographic presentation. It is expected to prove equally fruitful as an instructional technique for students in the University of Georgia field course on the geography of the Southeast. Each student will be expected to make constant reference to his chorographic compage map as he rides through the Southeast in order to increase his powers of field observation and notation while he improves his knowledge of the area.

CHIAO-MIN HSIEH—*The Aborigines of Taiwan.*

The mountains of Taiwan contain 160,000 aborigines. This is only 2 per cent of the total population of the island, yet they occupy about one half the entire surface.

Ethnologically, these native people are Malayan or Indonesian and may be divided into seven groups. Prior to the arrival of the Dutch and the Chinese in the early 16th century, the aborigines were spread over the whole island, with 293 tribes.

It was the waves of Chinese immigration in the 17th century which drove the aborigines into the mountains. Those who remained on the plains mixed with Chinese. They can be divided into ten groups and have now lost their language and customs.

The vertical distribution of the natives as a whole is as follows: a quarter each are found below 100 meters, at 100–500 meters, and at 500–1000 meters; an eighth are found at 1000–1500 meters; five per cent at 1500–2000 meters; while over 2000 meters are less than one per cent.

The tribes practise hunting, fishing, and migratory farming. Millet, sweet potatoes, and dry rice are their chief crops. Fields which reach 40 degrees in slope are cultivated. The mountains of Taiwan are said to be one of the highest cultivated mountain areas in the world.

The natives practise a series of rituals before every important farming activity. But unlike other primitives, the tribes in Taiwan have numerous ritual ceremonies and with different priests. This is related to their different altitudinal habitats, and also to the rugged nature of the terrain which handicaps communications.

The Chinese, Dutch, and Japanese, who came to the island in succession, brought changes in the life of the aborigines; the changes were greatest on the plains where the aborigines were completely absorbed, less on the slopes, and least at highest elevations.

PRESTON E. JAMES—*A Land Use Map of Northeast Brazil.*

As a part of a study of the background of economic distress in the Northeast of Brazil, carried out in 1950, a map of land use was prepared. This paper discusses the categories used on this map, the problems of preparing it in the field, and its utility for the geographic analysis of this area. Since this study was intended to contribute to the programs of resource and land use inventory of the World Land Use Survey (International Geographical Union) and the Committee on Land Classification and Use (Pan American Commission on Geography), the categories of the World Land Use Survey were adopted.

The experiments with field mapping on chorographic scales (defined as those scales on which the specific fields and specific soil types occupy areas too small to show) suggest that there are two methods of generalizing the topographic details: 1) by identifying the predominant character and mapping a whole area in terms of this predominant characteristic; or 2) by defining characteristic and recurrent associations of phenomena and mapping in terms of associations. On 1/1,000,000 scale, for example, it is possible to map an area as predominantly occupied by sugar cane; or this area could be mapped as an association of sugar cane fields, large-scale *usina*, ridge tops in woods, valley bottoms in pasture. Experience in the study of Northeast Brazil seems to indicate the desirability of defining categories in terms of associations rather than predominant characteristics, and of promoting experimental studies for the purpose of devising acceptable methods for tying the associations back to their components by large-scale (*i.e.*, topographic) sample studies.

GEORGE F. JENKS—*"Pointillism" as a Cartographic Technique.*

"Pointillism" is a method of painting in which colors are separated into their component hues and these are then applied to a white surface in the form of dots. Juxtapositional mixture of the component colors takes place if the work is viewed at a distance because the eye is unable to resolve the individual dots. Artists Sisley, Seurat, and others have used this technique in both portrait and landscape works. A similar principle is used in three of four color offset printings of colored pictures in magazines.

This paper results from experimentation with pointillism as a cartographic technique in the hope that transitional distribution could be more accurately and realistically shown. A map of cropland harvested in the United States in 1949 was used for the test. Colors were assigned to each crop and then these colors were plotted as dots (each dot equalling 10,000 acres of cropland both in value and area) in their true position on the map. Since cropping patterns change, the relationship between the dots must change causing blending of distinctive colors for each combination of crops.

This map testing pointillism as a cartographic technique has the following to recommend it: 1) much more accurate representation of transitions; 2) excellent representation of detail, which gives the map reader the advantage of adding optical memory to intellectual memory (all of us are aware of the great variety of crops grown in the corn belt, but with this method the map reader can actually see these crops); and 3) the resultant map is dual purpose in that it can be used for close study with much detail and when viewed at a distance only major patterns are visible.

Further experimentation should be done with other colors, other scales, and in reproduction of the map in printed form.

STEPHEN B. JONES—*The Role of Geography in the Study of National Power.*

The study of national power involves more than one discipline, but geography is an indispensable part. The oversimplified use of "geography" and "the geographical factor" by social scientists as synonyms for physical geography is subject to criticism. The work of geographers has dealt with population, industrial capacity, and other aspects of national power and conceivably might be extended to intangibles like leadership and morale. A familiar classification of factors of power is presented. A further classification is proposed, in which the ambiguous terms "actual power" and "potential power" are analyzed into five degrees of availability. These five classes are illustrated. The competence of geographers is mainly in terms of potential power, but may be extended towards actual power. Comparison of the factor and availability classifications shows that some factors fall primarily into the categories of "convertible" or "developable" power while others fall into the categories of "immediate available" or "mobilizable."

T. P. JOST—*The Country in Which Manna is Still Falling.*

Because of the political conditions existing in the U.S.S.R., true information concerning that country is very scarce. Today, as well as in the Czar's time, scientists who were political prisoners, played an important role in the survey of Asiatic Russia. Part of the information concerning the desert regions of the U.S.S.R. and contained in this report has been obtained from such a source.

The erosional work of the fastest river of the Soviet Union, the Amu Darya, is very violent. Erosion by the Amu Darya, destroying in places as much as twenty-five inches of land per hour, caused the shifting of its bed over four miles north-east in the course of the last sixty-five years. The city of Turtkul was deserted because

of the great expenses connected with the defense of this city against the erosional plague, and Nukus became the new capital of Karakalpak A.S.S.R.

The waters of the Amu Darya, constantly changing their course, contributed to the formation of Aral Sea three to four centuries before our era. This change also caused the drying up of the Western Uzboi River, which today forms a 700 miles long Wadi. The Amu Darya separates two desert regions of the U.S.S.R.—the Kara-Kum and Kyzyl-Kum. In these regions one can see several kinds of deserts and semi-deserts such as: "Shoku," "Hammada," "Takyr," "Shor," "Czel," "Adyr," and "Erg."

The "Kara" sands are young formations consisting of many minerals (over forty), while the "Kyzyl" sands are old ones among which, besides quartz, only iron-oxide and a small addition of other minerals may be found. To the most interesting phenomena existing in these deserts belong "Stony Chests," "Devil's Brushes," and "Stony Snow"—products of the weathering of rocks and evaporation of ground water.

In the deserts of Kara and Kyzyl-Kum, and in the "Ustiurt" plateau—constantly misspelled "Ust-Urt"—many valuable minerals can be found. These are: different salts, graphite, sulphur, ozokerit, coal, manganese, copper, oil, and others. So far, the minerals have been only partially exploited. The vegetation, at first seemingly scarce, contains about 2,000 of different kinds of grasses, bushes, and trees. The most interesting ones include: wormwood, "selin" grass, the manna plant, "igde" tree, and "saksaul" tree. This last one forms characteristic forests in sandy areas. The irrigated desert areas often form excellent soil for cultivation. Hence, there are many plans concerning the irrigation of these regions. Some plans are under construction, others have not yet been started. The first include the building of the Kutta-Kurgan Basin and Turkmen Canal; the others, construction of the Kara-Kum Canal, Amu-Daria-Zeravshan River Canal, irrigation of the Khiva plain by construction of a dam in the lower course of Amu Darya, and a canal joining the Amu Darya with Western Uzboi "Wadi."

Applying the "Soviet methods" of work, these plans will probably be realized in the course of ten to twenty years.

CHONG-RWEN KAO—*Geographic Factors Affecting the Distribution of Population in Sinkiang, China.*

Population distribution in Sinkiang, China, has a distinctive pattern related to oasis, valley, and piedmont.

In Southern Sinkiang, fringing Takla Makan, shoestrings of population, averaging 27 persons per acre, are related to available snow meltwater and wells. The total population is greater than in Northern Sinkiang, with major centers at Khotan, Kashgar, Turfan, and Kuchu.

In the Dzungarian Basin of Northern Sinkiang the productive Emil and Ili valleys are major population areas. The five political divisions are economically, climatically, and physically contiguous to and oriented toward the Central Asiatic Steppe region.

The piedmont in both Southern and Northern Sinkiang, with a shorter growing season and less level land, discloses less population, with the cities related to minerals: gold and petroleum.

Since the great variability in the geographical pattern of the Province's resources appears to be relatively permanent and since it is based on major physical features, it will probably always determine the main features of rural population distribution. Possible modifications through landscape alteration, drainage, irrigation, and the use of artificial fertilizers, are relatively small, expensive and generally only feasible in or near the fringes of the present population concentrations.

DONALD KERR—*Industrial Location in Canada 1939-1949.*

The industrial working force in Canada increased from 658,000 in 1939 to 1,170,000 in 1949, but the location of manufacturing industries altered very little. Most of the industrial expansion has taken place in the old industrial concentrations in Southern Ontario and Quebec. Alberta and British Columbia experienced the greatest rate of growth among the Canadian Provinces, but remain unimportant industrial areas having just over 100,000 workers engaged in manufacturing between them. Saskatchewan, in spite of the development of new industries by its Socialist government, has only 11,000 industrial workers. Manitoba, with only 42,000 people engaged in manufacturing, is still an agrarian province. The Maritime Provinces (60,000) remain unimportant industrially as well.

Greater Montreal is the most important industrial concentration, employing almost one out of every five production workers in Canada. Its rate of growth from 1939 to 1949 as measured by industrial workers was 87% exceeding the national average by more than 10%. Adding more manufacturing workers to its payrolls in the decade (1939-49) than the four western and four maritime provinces combined, it strengthened its position as a leading industrial city in North America!

Greater Toronto has also experienced considerable expansion during the last decade and it remains the second city in industrial importance in Canada. In fact, a sprawling Toronto region extending along the Lake Ontario plain from Oshawa to Oakville and inland for several miles may be identified. It employs approximately 210,000 industrial workers.

Greater Hamilton is the third most important industrial city in Canada, with almost 55,000 industrial workers. It continues to grow and undoubtedly the lake plain from western Toronto to Hamilton, already greatly urbanized, will become completely so within a few years.

Most other industrial concentrations in Southern Ontario and Quebec have grown more slowly than the leading cities. The Middle Grand River region, Greater Quebec, the lower St. Maurice Valley, Greater Ottawa, and Greater London have all lagged behind the larger concentrations. Windsor and the Niagara Region are exceptions. Greater Vancouver and Greater Winnipeg have experienced remarkable expansions in manufacturing in the last decade, but they still remain relatively unimportant industrial cities.

All in all, the locational pattern of manufacturing industries in Canada has

changed very little in the last decade and in many ways increasing concentration rather than national decentralization characterizes the period.

GEORGE KISH—*Some Aspects of the Regional Political Geography of Italy.*

Geographical considerations of political behavior in Italy include a multitude of factors, and, much in contrast with the United States, historical as well as socio-economic elements appear to play an important part. For example, in the 1946 plebiscite on the future form of Italy's government, 12 out of the fifteen provinces that made up the Papal States prior to Italy's unification voted for a republic rather than a monarchy. A similar phenomenon appears when one considers the 1946 and 1948 parliamentary elections in terms of the voting strength of the Italian Republican Party, the only party that made a showing besides the Big Three of Italian politics: the Christian Democrats, the Communists, and the Socialists. The map showing the voting for the Republican Party indicates clearly that the stronghold of the party lies mostly in the territory of the former Papal States and in a few scattered areas elsewhere in Italy.

Considering the 1948 parliamentary elections on the basis of minor civil divisions, and narrowing the focus of inquiry to the region of Emilia, the region showing the strongest Leftist vote in Italy, a striking correlation is shown between electoral results and elevation. Of the 339 minor civil divisions in Emilia, 96½% of those lying below 200 meters had a Left majority, while of those lying above 200 meters 93% had a Center-Right majority. Further comparisons of these electoral results with the agrarian structure of the highlands on the one hand, the low hills and plains on the other, indicates that it is the small independent farmer who votes for the Right, while the tenant, sharegrowers, or farm laborer is more likely to cast his vote for the Leftist coalition.

LESTER E. KLIMM—*Empty Areas in the Old Northeast: With Examples From New Jersey.*

As a step toward improving the definiteness of statistical maps of the northeastern states of the United States, this investigator has outlined the section's "empty areas" on a scale of 1:1,000,000.

An "empty area" is defined as one a) at least one mile in least dimension, b) whose boundary is at least one-quarter mile from any used structure (house, factory, oil well, mine tipple, etc.), c) which contains no used structures, and d) has no agricultural use.

The empty areas were outlined on the topographic sheets of the largest scale and the latest dates available. Where such dates were not recent, the most recent state highway planning maps were used. The areas so determined in the office were then taken into the field and checked.

The compiled map shown as an illustration is that for the State of New Jersey. For the first time it is possible to see the actual areas not used for agriculture, industry, or dwelling. Not only the "Pine Barrens," but also considerable areas at the southern end of the peninsula, as well as lesser areas in the north, stand out. On

all maps showing population, occupations, agricultural land use, and many other cultural criteria, these areas can now be definitely indicated as "sterile," or "empty."

The author invites criticism of the method, or results.

This program for mapping and analyzing the empty areas of the "Old North-east" has been supported by a grant from the Office of Naval Research.

HIBBERD V. B. KLINE, JR.—*Southern Interior Africa and the Sea.*

Southern Rhodesia, Northern Rhodesia, and the Katanga area of the southern Congo Belge are linked together by a common dependence upon the export of their mineral wealth to overseas markets through an interconnecting railway system that delivers this traffic to the sea. The economy of these lands was built by the "Cape to Cairo" railway and its lateral connections and rail-water extensions to the ports. Today the capacity of this surface transport system is inadequate for the requirements of both the internal economies of Southern Interior Africa and the demands of Western Europe and the United States for raw material shipments. The nature of the transport inadequacy is examined at the ports of Beira, Lobito, and Matadi, and on the several railway lines. Proposals to increase surface transport capacity are analyzed, particularly in relation to new railway construction.

WALTER M. KOLLMORGEN—*Settlement Control Beats Flood Control.*

Present methods of coping with flood problems in the Midwest are too expensive in terms of money and land, *i.e.*, in land flooded behind dams. Alternative methods of mitigating flood losses should be explored and the public should be presented with a choice among several plans rather than a one-or-nothing program.

Recent heavy flood losses resulted primarily from an overextension of improvements into floodplains and from dike strictures or bottlenecks in urban areas. The great benefits that are claimed for present and proposed flood control works rest largely on the protection they are to afford to these overextended non-agricultural improvements as well as misplaced farm improvements. Moreover, present inventories of flooded areas list only losses; they fail to list significant benefits in soil and drainage improvements.

Proper zoning of floodplains in combination with local set-back dikes in urban areas can serve to cancel many of the alleged benefits associated with the present program. Such zoning means settlement control or geographic engineering. Settlement control will not only mitigate flood losses, but will also conserve basic resources because the present program of impounding run-off on wide floodplains will extinguish from 25 to 40 per cent of the rich floodplain agricultural lands along major streams of the Midwest.

GEORGE KURIYAN—*The Population Problem of India.*

The subcontinent of India, comprising the two independent political units of the Union of India and Pakistan, had in 1951 a population of about 433 millions, approximately a fifth of the world population. In 1901 the number was only 235 millions. Thus during the last fifty years, it has nearly doubled. This increase is due to a high birth rate and a diminishing death rate. The greatest increases have been

in the more fertile tracts like the Gangetic Delta, West Coast, etcetera, or in parts where virgin lands have been brought under the plough either through deforestation or irrigation. In a country which is almost entirely agricultural this has resulted in producing an enormous pressure of population on land, giving a per capita acreage as low as 0.75, and in its wake it has brought several other incidental consequences, as for example the emergence of a class of landless laborers, minutely fragmented and scattered holdings, and subsistence farming.

The solution to the problem of finding food for an annually increasing population of 5 millions is by no means easy. It is not likely that the area under cultivation can be expanded significantly. Recent evidence seems to suggest that the limits have been attained already, but it may be possible to increase the yield substantially through consolidation of holdings and by the application of modern scientific methods. Dietetic changes by the introduction of alternative foods, like fish, tapioca, and potatoes, besides being a temporary solution, may result in supplementing the appallingly low intake of proteins at present. Yet another method is to suggest industrialization to enable food to be purchased, but the natural resources of the country make it appear improbable. Emigration might be considered, but it must be remembered that the history of Indian emigration has created more problems than it has solved. Birth control or its modern counterpart, planned parenthood, becomes essential and the little evidence, extremely meager as it is, seems to suggest that Indian women are not entirely averse to it.

EARL E. LACKEY—*Probabilities as Related to Skewed Temperature Distributions.*

In any temperature variate which closely approximates a normal distribution an ordinary probability scale may be used with considerable confidence. For example, at Richmond, Virginia, the January mean temperatures follow a near normal distribution. On a normal probability scale the chances are that the January mean minimum temperature according to a 24-year record will be 26°F or lower 20% of the time; 24°F or lower 10% of the time; and 21°F or lower 5% of the time. These probabilities do not deviate from the actual by more than 1° or 2°F.

However, when the temperature variate is severely skewed the normal probability scale is not satisfactory. This holds true for the January daily minimum temperatures at Miami, Florida, where the actual temperatures often fall as much as 10° or more below that indicated on the normal probability scale. If the same data be plotted on a specially designed skew-log probability scale the chances closely approximate actuality. For example, at Miami, the chances are, according to the skew-log probability scale, that the January daily minimum temperatures will be 50°F or lower 10% of the January days; 38°F or lower 1%; and 36° or lower 0.5%. These probabilities are within 1° or 2°F of the actual record of 310 January days (1942-1951). The skew-log probability scale requires a minimum of computation, and also is surprisingly well adapted to near normal distributions.

DAVID W. LANTIS—*The Los Angeles Lowlands of California: "Rurban" Oasis in Transition.*

The Los Angeles Lowlands, Mexican outpost of 1846, has become a complex

oasis. Its five lowlands, Los Angeles Basin, Valley of the South, Santa Ana Plain, San Gabriel Valley, and San Fernando Valley, support half of California's population.

Accelerated transformation from ranchos into cities has produced booms and depressions; Los Angeles County remains the nation's agricultural leader.

The Lowlands focus upon Los Angeles, creation of the automobile, city of single residences, incorporating 453 square miles. Public transportation is inadequate; thoroughfares cannot accommodate the county's 2,000,000 automobiles.

Visitors may overlook dispersed cultural endowment. Despite minority groups, most immigrants to the Lowlands are native-born Americans. Perhaps no other metropolitan area so reflects American civilization's omnitude.

Multitudinous business districts are disparate. Downtown Los Angeles has banking and government; Hollywood, communications; Crenshaw, parking fields but no theatres; Beverly Hills, luxury shops; Huntington Park, lower-price stores.

Industrially, the Lowlands ranks third in the nation. Varied output reflects distance from the American Manufacturing Belt and local market magnitude. San Pedro possesses port-type manufacturing, but the major industrial belt, extending northward towards Los Angeles, includes meat packing, oil refining, steel fabricating, auto assembling, and rubber factories. Clothing, cinema, and aircraft industries are largely elsewhere. A tourist industry of magnitude is dispersed.

Los Angeles Basin has greatest complexity. Most Angelinos reside here; also, the inhabitants of Long Beach, Santa Monica, and satellites. Peripheral dairy and truck farms, and marshland beef ranches near the harbor, are ephemeral. Lakewood's 17,000 homes have supplanted beanfields of 1949.

San Fernando Valley engulfment has quickened. Much land is within corporate Los Angeles; Van Nuys has a sub-civic center. Industrialized Burbank and Glendale have mushroomed. Since 1945 factories have appeared elsewhere, also housing tracts. Agriculture remains dominant in the west.

San Gabriel Valley is being transformed, with industrialization of Pasadena, Alhambra, and Monterey Park. Factories and homes are replacing oranges around Azusa, Glendora, and Arcadia.

Despite Pomona's aircraft and Fontana's steel, the Valley of the South remains agricultural, with fruits and nuts, cattle, grains, and vegetables. Already citrus communities are becoming industrialized.

Least altered is the Santa Ana Plain, longtime citrus producer. Santa Ana and Anaheim are receiving industrial stimulus.

Urbanization of the entire Lowlands appears inevitable.

ROBERT L. LAYTON—*Recent Changes in the Salt Lake Milk Shed.*

The patterns of production, processing, and distribution of grade A milk have recently undergone many changes in the area of Salt Lake City, Utah. The industrialization and urbanization of central Utah caused an increase in the demand for fresh milk. At the same time it caused a drop in production from areas near the cities.

During the war the shortage was met by allowing grade C milk to enter the market. After the war, however, the Board of Health imposed strict regulations on Grade A milk which again caused a shortage to occur.

To overcome this shortage, and to meet the continuing high demand, the milk shed, which consisted of five counties in 1938, has been expanded to include sixteen counties. The marketing area for processed milk has been expanded during this time so that it now extends into parts of six states.

In spite of this expansion, milk produced for sale in Salt Lake still comes from herds averaging 15 cows which are maintained as a part of the diversified economy of small irrigated farms. Increase in grade A production has come by shifting these small herds from grade C to grade A production at the expense of the creamery industry of the state.

M. E. MARTS—*Upstream Storage Problems in Columbia River Power Development.*

Upstream storage is required in order to develop more than a small fraction of the power potential of the Columbia River. Storage is necessary in order to supplement low winter stream flows, thus eliminating power shortages during the season of peak power demand. A plan of development calling for a series of downstream run-of-river power plants balanced by six upstream storage projects having an aggregate active storage capacity of 19,000,000 acre-feet was developed by the responsible federal agencies. Construction of the run-of-river plants is proceeding steadily. The difficulty of obtaining adequate upstream storage is one of the most baffling aspects of the entire program. Slightly less than half of the storage space considered essential has been developed. There is little prospect of early construction of three planned reservoirs. A review of the problems inhibiting development of these storage projects, or equivalents, suggests that the desired storage may not be achieved. The inhibiting factors illustrate many interesting aspects of the geography of the Pacific Northwest. These include sectionalism, resource conflicts, political and philosophical controversies, and problems of international cooperation. A program aimed at making the storage projects more attractive financially to people in the upstream areas, and at a better general understanding of the need for such storage, may overcome some of the difficulties. If such a program is not successful, various alternative and presumably higher cost sources of energy must be relied upon to meet the region's increasing energy deficit.

EUGENE COTTON MATHER—*The American Beef Dilemma: Fact or Fancy.*

Are the American people confronted with an eventual Asiatic grain and vegetable diet? It is apparent that the human population of the United States is outstripping the number of beef cattle in the nation. Severe shortages of beef have occurred during periods of increased consumer purchasing power, and per capita consumption of beef in the United States has undergone a gradual, though irregular, decline since 1900. Older and more densely settled nations of the world have experienced the same dilemma with regard to meat supply. Their solution has been a gradual decrease in meat consumption per capita with concomitant increases in the

use of grains as human food. The principal bases upon which pessimists have predicted their dire conclusions are given and a brief evaluation of each follows. Several striking inconsistencies regarding the question of our future food supply are noted, and five major avenues of great promise for expanded beef production are outlined.

HAROLD M. MAYER—*Great Lakes—Overseas: An Expanding Trade Route.*

The St. Lawrence route between the Great Lakes and overseas has been in use by regularly-scheduled ocean liners for two decades, in spite of limitations upon the size of vessels imposed by restricted dimensions of present locks in canals circumventing the St. Lawrence rapids west of Montreal. Except for the war years, the number of sailings and volume of traffic between Great Lakes and overseas, principally European, ports has been increasing annually. In 1952 there were 140 scheduled round-trips during the eight-month navigation season, by 43 ships of seven regular European steamship lines, in addition to tramp trips. Scheduled services connect Chicago, Milwaukee, Detroit, Cleveland, Toronto, and other lake ports with the United Kingdom, northwestern Europe, and the Mediterranean. Vessels are specially designed, mostly post-war. They are limited in size to 254 foot length, 42 foot beam, 14 foot draft, and about 3,100 deadweight tons. Total direct cargo movement between Great Lakes and overseas without transshipment exceeds 200,000 tons per year, with about 50 per cent greater westbound than eastbound tonnage. Cargoes in both directions are diversified, with raw materials, manufactures, and foodstuffs moving both westbound and eastbound. Among the principal westbound movements are woodpulp, iron and steel products, aluminum products, clay, alcoholic beverages, and manganese. Eastbound movements include primary iron and steel products, automobiles, many types of machinery, meat products, grain, and flour. Vessels fill out their loads at Montreal. During the Great Lakes closed season they are employed in European, Mediterranean, and other "short sea" trades.

Rates by direct vessels are 10 to 25 per cent under the combination rail-water rates through Atlantic seaboard ports, and time enroute is comparable. Lack of combination or export rail rates through Great Lakes ports, however, confines the port hinterlands primarily to the metropolitan areas of the individual lake ports.

Prospects for expansion of the direct Great Lakes-overseas trade in the near future, assuming no immediate enlargement of the Seaway, depends upon world conditions, the future of the foreign-aid program, the status of labor unrest at seaboard ports, integration with rail and inland barge routes in the midwest, promotional activities of present and potential ship operators and their agents, and improvement of general cargo terminal facilities at Great Lakes ports.

With completion of the proposed Seaway enlargement, present ship lines will have a competitive advantage of "know-how" and contacts in the Great Lakes area, but the competition will increase. Most present operators are planning larger vessels in anticipation of a more adequate Seaway.

H. H. McCARTY—*An Approach to a Theory of Economic Geography.*

The desire for a body of theory that could be used to explain characteristics of the economic occupancy of various parts of the earth's surface is as old as the interest in

economic geography. In detail, it appears that such a body of theory would be made up of sets of interrelated principles, each of which would be designed to explain locational patterns assumed by individual types of economic activities. Locational principles would take the form, "where x, there y."

Source materials for the derivation of these principles might normally be expected to be of two types: data describing actual earth locations, and data descriptive of the processes that produce those locations. In general, geographers have favored the former type, while economists have made greatest use of the latter.

Geographic investigation has produced generalizations applicable to the location of economic activities primarily through observation and measurement of coincident phenomena. Earliest of these statements came from studies which often contained generalizations of the "where x, there y" type. Students of larger areas frequently produced these same types of correlations by utilizing comparative-mapping techniques. A major shortcoming of these procedures has been that only a few elements could be considered.

Advocates of the "processes" approach tend to emphasize causation rather than areal association. In general, they assume that there is a tendency for all types of economic activities to seek locations at which they can perform their functions at least cost. Least-cost locations thus become optimal, and models may be created showing optimal locations for any type of economic activity for which adequate cost data may be obtained. These models may then be used (as hypotheses) for the comparison of hypothetical locations with actual locations. Divergences in pattern may then be noted and the hypothesis altered to allow for them (often by inclusion of factors not ordinarily associated with monetary cost). Ultimately the hypothesis becomes generally applicable and thus takes on the status of a principle.

In practice the coincident-phenomena approach has been criticized because it has rarely produced principles capable of wide application; and the process approach has been criticized because it has rarely been carried far enough to explain actual patterns of economic occupancy. Obviously there is need to consider possibilities of blending these two approaches. For economic geographers, in particular, there would seem to be much merit in the utilization of least-cost models as hypotheses in the analysis of concrete situations.

SHANNON McCUNE—*Geographic Regions of Korea.*

Consideration of the geographic regions of Korea leads to a better understanding of the whole of Korea's geography. Similarities and diversities occur throughout the strategically located peninsula. Grouping together places with general similarities and then distinguishing between these areas on the basis of general diversities has been common in Korea's history; an example is the organization and function of political provinces and counties.

Three categories of decreasing area and with increasing attention to details of geographic diversity have been used in the grouping of places presented in this classification. The peninsula is, first, divided along provincial boundaries into two Realms, the North and the South, with the criterion of climatic differences and con-

sequent diversities in intensity and character of land utilization and in population densities. The Realms are divided, secondly, into Geographic Regions, of which there are three in the North (the Northern Interior, the Northeastern Coast, and Northwestern Korea) and seven regions in the more diversified South (the East Central Coast, the Central and Southern Mountains, the Central Plains and Hills, Southwestern Korea, Southeastern Korea, Ullung Island, and Cheju Island). Regional boundaries, drawn along county borders, follow terrain features and mark differences in human geography. The criteria used for regionalization are mainly differences in terrain and climate, major factors in the character of the geographic totalities in Korea. On varied criteria of local diversity most of the geographic regions are subdivided, thirdly, into Sections.

In Korea, the two Realms, ten Regions, and numerous Sections have been through the centuries closely tied into a national unity. When man-made barriers segregate Regions and Realms and negate the benefits of regional diversity the whole of Korea suffers and only chaos results.

ROBERT B. MCNEE—*Metapontino: A Case Study in the Work Rhythms of an Agricultural Area in Southern Italy.*

This paper analyses quantitatively the work rhythms of a representative area in Southern Italy in terms of 1) a work calendar, *i.e.*, estimates of the monthly labor needs for each of 7 locally significant crops; 2) work rhythms, *i.e.*, the estimated monthly pattern of labor need resulting from the peculiar combinations of crops found in each of four types of operating units and within the major work areas (the communes); and 3) the changes planned under land reclamation and land reform programs. The author concludes that Metapontino's work rhythms are highly unbalanced, being dominated by the harvest needs of the areally predominant grains. Seasonal unemployment resulting from these rhythms can be reduced by altering the work rhythms, *i.e.*, by the diversification of agriculture and by more judicious combinations of crops within local work areas. Major land reclamation and land reform programs are now attempting to carry out these changes, with great potentialities evident in some areas such as Metapontino.

ALEXANDER MELAMID—*The Political Geography of the Gulf of Aqaba.*

Compared to Egypt, the Gulf of Aqaba and its surrounding area offer few facilities for traffic between the Mediterranean and the Red Sea. Yet despite drawbacks men have frequently sought to trade with the East through the Gulf, bypassing Egypt. This is expressed in the patterns of political geography of the region.

Biblical Kings were the first to try this route. More is known about the endeavors of the crusaders, who established themselves in the town of Aqaba and on an island on the Sinai side of the Gulf. The efforts of Turkey after the British occupation of Egypt show a similar pattern: occupation of the town of Aqaba and penetration southward along the western side of the Gulf. Following British protests Turkey withdrew from Sinai and Turkish plans for the development of the Gulf were abandoned. A boundary with Egypt across the isthmus was demarcated

which, with modifications, has persisted to this day. After World War I and the conquest of the Hejaz by King Ibn Saud a boundary between Transjordan and Saudi-Arabia was drawn. This left an area at the head of the Gulf in British hands, a situation which was frequently interpreted as a British attempt to by-pass Egypt in trade with the East.

As a result of the Arab-Israeli war Israel obtained access to the Gulf. Due to physical and political difficulties Israel has not been able to develop much trade through its port at Elath. The bulk of traffic in the Gulf moves through Jordanian Aqaba; this is however only a small portion of the foreign trade of Jordan. Despite high Suez canal dues experts believe that all Gulf traffic can be routed more economically through Mediterranean ports.

E. WILLARD MILLER—*Recent Trends in the Pattern of European Manufacturing.*

At the conclusion of hostilities in 1945, a large portion of Europe's industrial capacity had either been destroyed or was not functioning. Since Europe had one of the great industrial economies prior to World War II, it was imperative for the welfare of millions of people that industrial productive capacity be restored as quickly as possible. It is the purpose of this paper to analyze recent changes in the pattern of European manufacturing.

The area selected as the basis of study includes all of Europe except the U.S.S.R. The data for the study were secured principally from United Nations reports. A series of fifteen maps has been prepared on the textile, engineering, and chemical industries to show prewar and postwar production trends.

It is revealed that while European industrial production was only 85 per cent of its prewar output in 1947, recovery was rapid so that by 1948 the prewar level had been surpassed, and, in 1951, the index value of European industrial production was 140 compared with a 1938 value of 100. The rate of recovery, however, varied considerably with the individual countries. One of the striking features in the postwar period was the long industrial collapse of Germany where recovery lagged greatly until 1949. During the postwar period greatest relative gains in industry have occurred in the United Kingdom, Sweden, Norway, Denmark, Finland, Yugoslavia, Poland, Hungary, and Bulgaria. Countries that have experienced moderate expansion include France, Belgium, Netherlands, Switzerland, and Spain.

While this survey shows that there are definite trends of economic recovery in Europe, the signs of recovery now evident may not yet be conclusive that Europe has a stable industrial economy. There are at least three fundamental economic problems that must be solved. First, there has been no general expansion in the area's international trade; second, there has been essentially no recovery in private investment; and finally, no solution is in sight for the problem of general "over-capacity" in such fields as textiles.

The general conclusion would seem to be that fundamental improvements of Europe's economy depends upon changes in the present economic and political structure not only in that area, but also in the rest of the world. The cyclical upswing in

Europe's production now evident is indicative, however, of continued economic vitality there, even in the face of fundamental difficulties.

ROBERT B. MONIER, NORMAN E. GREEN, AND GEORGE R. PAPPAS—*Preliminary Findings on the Development of Criteria for the Identification of Urban Structures from Aerial Photographs.*

Development of observational techniques utilizing aerial photographs for investigation of specific aspects of urban agglomerations will provide a new and valuable methodology for geographers and sociologists engaged in urban research. The overall research plan envisages identifying from aerial photographs specific inter-related socio-physical aspects of an urban complex. The initial study was limited to the demographic and housing aspects (population numbers and densities, house types, and distributional patterns) of a specific city.

Birmingham, Alabama was chosen for the pilot study, and reconnaissance stereo-photography was utilized. Selected census tracts were delineated and a set of "visible photo keys" were established, by means of field and photo observations, as criteria of residential structural types. Data were collected for residential structures block by block for six census tracts from aerial photographs. These data were then checked by field observations and the results tabulated. It was found that the developed criteria permitted accurate identification of residential structures within one per cent error, but was not reliable as a means of identifying individual family units within multi-residential structures.

Additional studies are planned to investigate the further potentiality of utilizing aerial photographs for collection of other types of ecological data. It is believed that this study succeeded in indicating the value of aerial photography as a source for data on urban complexes in terms of indices correlated with residential housing structures.

C. F. MOSES—*Agricultural Land Use in a Sampling from the Southeastern Ohio Hills.*

This is a report on land use and land use change in sample counties crossing from the glacial boundary eastward to the Ohio River. The area includes typical southeastern Ohio hill country and includes some coal-, oil-, and gas-producing area. In the early days general farming yielded subsistence and surplus for sale. Through the years, urban activities attracted men from the farms, but increased the demand for farm products. In the 1930's commercial farming developed greatly. The number of farms reporting tractors increased more than ten fold between 1925 and 1950. Fertilizer, lime, and power machinery enabled the farmer to produce primarily for sale, and cost him much. A better adjustment of land use to land capability and an increase in intensity of production are evident. Urban functions are competing for farm land. New trends in farming develop in order to give an attractive wage for the farmer's time. Specialization reduces the number of kinds of machines which a farm must support. On these hills there is need for considerable grass cover to protect the surface from erosion. It is, therefore, likely that

livestock will continue to be an important part of the economy. Research and changes in the natural and social conditions will involve continuing readjustments.

DONALD R. PETTERSON—*The Distribution, Nature, and Size of White Settlement in Northern Rhodesia in Relation to Mineral and Agricultural Production.*

Within British Tropical Africa, the Protectorate of Northern Rhodesia is unique in the degree to which the presence of economic minerals has influenced white settlement. The majority of Europeans are situated near the mines; 45.5 per cent of the Europeans employed in the principal industries are engaged in mining, and fluctuations in mineral production have been accompanied by fluctuations in the European population. The principal agricultural settlement is in the Railway Belt wherein is found access to good transportation, a favorable environment, and various types of government aid. Two smaller agricultural settlements at Fort Jameson and Abercorn are hampered by isolation. Elsewhere the small and widely scattered European settlement reflects the unattractiveness of the environmental, economic, and political factors prevailing in most of Northern Rhodesia.

ALLEN K. PHILBRICK—*Principles of Geo-cartography.*

There are principles which may serve as guideposts for cartographers working in geography. A successful map within the context of a specific geographic purpose requires sound judgment in the application of the principles of *generalization, scale, suggestion, contrast, gradation, balance, emphasis, repetition, simplicity, and unity* to the construction of a unity of graphical forms with geographical content. The principles of geo-cartography have parallel application in geographic thinking as well as in graphical composition.

Stated as principles these ten words may be expanded as follows:

1. All visualization of reality is generalized.
2. All generalization is proportional to scale.
3. The form of visualization is suggestion.
4. Visualization depends upon contrast.
5. Contrasts are gradations of change.
6. Truthful visualization of parts in relation to the whole depends upon balance.
7. All phenomena are not of equal importance.
8. Reality repeats itself with variations.
9. The ideal of all expression is to say the most with the greatest economy of means.
10. Reality is indivisible.

Each graphical problem appears to be unique. Yet each such problem has something in common with every other. The similarity lies in the fact that every graphical problem is capable of a variety of satisfactory compromise solutions attainable through the combined application of the principles of geo-cartography in such fashion that they will enhance one another rather than cancel each other out.

NORMAN J. G. POUNDS—*France and "Les Limites Naturelles" from the 17th to the 20th Century.*

Until the 17th Century the choice of political boundaries was justified by historical argument. In the 18th, a concept was arrived at, drawn from the Law of Nature. The "limites naturelles" of a state were those which gave it the right size, resources, and population for its efficient functioning. This argument is illustrated from the writings of Locke, Montesquieu, Turgot, and Rousseau. It was carried to its logical extreme during the French Revolution, and then received its clearest expression from Gregoire and Condorcet. Early in the 19th century, the concept drawn from Natural Law was replaced in Germany by one based on language distribution; Fichte and Arndt illustrate the development of this doctrine, which came later in the century to have considerable political significance. It contributed, however, to the several attempts to map the linguistic frontier in western Europe. These are briefly traced.

To the German argument based on language or "race" the French opposed one based on history and culture; that, in effect, political boundaries should divide culture areas.

Lastly, during the 20th century, the defeats and military weakness of France led to a temporary emphasis on strategic or military boundaries.

MALCOLM J. PROUDFOOT—*Israel: Persecution and Forced Migration Produce a Nation.*

The Jews, for centuries persecuted and forced to migrate, scattered as unwelcome or exploited minority groups among the non-Jewish peoples of the world, gradually acquired freedom associated with the development of 19th century western liberalism. Centuries of adversity had produced a high degree of ethnic cohesion among the Jews and, though scattered, they had become an international force of considerable and increasing economic and intellectual significance. Gradually, the Jews of Britain, France, Germany, the United States, and of other liberal countries were becoming assimilated members of their respective societies, reaching top positions of public trust, and experiencing only mild forms of discrimination.

The rise of Hitler to power in Germany, beginning in 1933, produced an astonishing and deplorable retrogression in that civilized country. Jews, in particular, were beaten, disenfranchised, socially ostracized, and thousands were confined to concentration camps. Under the threat of persecution, German and Austrian Jews began to migrate at once and, by the beginning of World War II, several hundred thousand had migrated to countries throughout the world, of whom approximately 100,000 gained entrance to Palestine.

In 1939 the population of the British Mandate of Palestine was 61 per cent Arab. Unhappily for the British, during World War I they had made what was interpreted by the Arabs and Jews alike as a promise to each of future sovereignty in Palestine (McMahon Promises, 1915; Balfour Declaration, 1917). Because of continued opposition to Jewish immigration by the Arab majority, and because of strategic as well as other considerations, the British in 1939 restricted future Jewish

immigration to Palestine to 50,000 persons for a five year period, plus 25,000 refugees.

During World War II heroic efforts were made by the U.S. War Refugee Board, by various Jewish agencies, and by other organizations and individuals to rescue Jews from Germany, and from German occupied or dominated countries. Several hundred thousand Jews managed to escape, although millions were destroyed in concentration camps. Of those who escaped, 58,000 gained admission to Palestine, but of the latter, thousands forced their way into Palestine illegally. Jewish antagonism towards the British for their immigration restrictions increased, although these were no more than comparable to those imposed by the United States and other countries throughout the world.

After the War, pressure to permit Jewish immigration to Palestine intensified, but the British stood by their policy of 1939. This pressure, supported in large measure by the money and administrative skill of United States Jews, made possible a flotilla of ships and the hazardous operation of transferring European Jews to Palestine (48,450 persons), while rendering the mandate costly and disagreeable through riots and other forms of civil disorder. Arbitration by the United Nations was of no avail. Finally, with the termination of the mandate by the British on May 15, 1948, the State of Israel was immediately proclaimed, and war broke out between the Jews and Arabs. The latter were quickly routed, and about three-quarters of a million Arabs were forced to migrate. Israel, applying the principle of unrestricted Jewish immigration, has, since its founding to the end of 1951, admitted 684,000 Jews (331,600 from Europe). Persecution and forced migration has produced a Jewish nation; a nation with exceptional ethnic cohesion and intense national loyalty; Jewish sovereignty over a fragment of the earth's surface; Jewish area.

JOHN K. ROSE—*Food Resources.*

The destruction and disorganization of the World War II period did not result in widespread famine as feared. World food production now exceeds pre-war levels by a substantial margin. Food quality has also improved; some of the "protective" foods as well as some of the major energy source staples are at record levels. Nevertheless, the increase has not kept pace with population increase. Also, there is further distortion in the geographic pattern; surplus production is even more localized in the new world, particularly North America, with resulting trade and financial problems. Carry-over stocks are not large; some consider them inadequate.

For the future (say, the rest of this century) the expansion of food production on the *extensive* margin appears likely to be modest, not so much because land is not potentially available, but rather because developments on the *intensive* margin will have competitive economic and social advantages. Increased application of capital and technological resources (including management) to land now in agriculture appears likely to provide much of the increase in food. With some 58 per cent of the world's population classed as agricultural it seems hardly possible that this resource will be a seriously limiting one on agricultural production during the period considered.

Wider vistas beyond present frontiers include synthesis of amino acids and other foods as well, harvesting the sea, where the annual use of carbon in photosynthesis is approximately 9 times the annual use in the atmosphere. Short of major natural disaster and in spite of the ultimate logic of the mathematics of Malthus, we will have other banquets.

GORDON B. SCHILZ—*Burma's Mechanized Transportation, 1950-51.*

Mechanized civil transportation facilities are owned and operated by the Union of Burma government in three competing categories: Inland Water Transport for the Irrawaddy-Chindwin river; Burma Railways; and Union of Burma Airways. The Rangoon-Mandalay, Mandalay-Lashio-China (Burma) road, and the Union (Ledo or Stilwell) road of northwestern Burma do not seem to have a clearly defined maintenance program although they are freely used by traffic except in insurgent areas.

The Union of Burma Airways daily serves Moulmein, Bassein, and Mandalay. Several flights a week are scheduled to the Arakan and Tenasserim coasts, and North Burma. Radio aids and macadam landing strips are available. Fog slows air and river traffic in Central and North Burma during the October to January cool season.

The Inland Water Transport maintains year-round traffic between Rangoon and Bhamo, and a wet-monsoon season schedule on part of the Chindwin. Double-deck, stern-wheel passenger boats on the Bhamo run take seven days up and five days down river. In addition to government-owned freighters and barges, the Burmah Oil Corporation provides its own petroleum carriers.

The Burma Railways, meter-gauge, daily operate 800 miles northwards from Rangoon via Mandalay and Saigaing to Myitkyina. Until 1952 insurgent bombing and occupation of a 20-mile stretch between Pyinmana and Toungoo caused serious stoppage of rail traffic. The Shan plateau is entered twice: Mandalay to Lashio, parallel to the Burma Road; and Thazi to Kalaw-Heho. The northern Tenasserim Coast has rail service, but the Burma-Siam railway is no more.

A much-used macadam highway connects Rangoon and Mandalay. Northeastward from Mandalay the black-top Burma Road carries the major amount of traffic across the Shan highlands to the China border. The graveled war-built Union Road from northeastern India across North Burma reaches the Burma Road near Muse.

THEODORE SHABAD—*Statistical Sources for the Study of Soviet Geography.*

United States geographers interested in the USSR and its satellites have relatively wide access to descriptive materials in Russian and, to a lesser extent, in English. They are, however, greatly handicapped by the general lack of statistical data for these areas. While the Russians are publishing more about their country than is commonly supposed, the fact remains that no concise statistical handbook or similar reference work exists. This paper examines how, in the absence of explicitly stated figures, Soviet statistics pertaining to population and the economy can be made available to the geographer in spite of the existing difficulties.

In the realm of population research and in the absence of comprehensive census publications, recourse can be had to the published lists of election districts. Soviet candidates for elective bodies represent constituencies with fixed population norms. Election districts are frequently revised in accordance with the latest state of the population and all details regarding their number and territorial extent are published. This permits the calculation of most of the items of interest to the population geographer, including total population of areas, their urban and rural components, particulars regarding major cities, and population density.

In the field of economic statistics, use can be made of annual official statistical releases in which output is expressed in terms of percentage increase (or decrease) relating to the previous year. These percentage figures can be collated for a number of years and related to a base year for which actual output is known. In addition to these annual announcements, many useful data are contained in the publications of the Five-Year Plan of 1946-50 and the release of its fulfillment, as well as in speeches on the occasion of major public events. The statistical series that can be thus obtained and which are of use to the geographer cover such items as the output of heavy industry (coal, oil, steel, electric power) and consumer items (textiles, construction materials, food products), the acreage, output and yield per unit area of the major crops, livestock numbers, freight carried on railroads, river transport, intercoastal transport, and truck carries, as well as partial data on the labor force. Area-wise, such statistics can be obtained not only for the USSR as a whole, but also for the constituent republics and lesser divisions.

JAMES A. SHEAR—*Variability of Monthly Precipitation in the United States.*

The variability of the monthly precipitation values from the long-period mean is studied for the United States.

Using the precipitation data of 223 stations for the period 1891-1930, the coefficient of variation is computed for each month at each station. These variability values are analyzed with the aid of isopleths on a series of twelve monthly maps (scale 1:12,000,000). The seasonal fluctuations in variability are discussed and interpretive suggestions are given.

The relationship between variability and the amount or mean precipitation is studied by the use of scatter diagrams. By considering stations having the same mean precipitation, variability control factors other than the amount are discovered.

The use of probability criteria associated with the normal distribution is discussed and the results of their application to monthly precipitation data are shown.

KIRK H. STONE—*Alaskan Ice-Dammed Lake: Lake George.*

Ice-dammed lakes are a marginal drainage form of mountain glaciers. Most are water bodies of less than 15 square miles and are relatively permanent. Several drain naturally at irregular intervals while a few empty themselves regularly. The emptying process is rapid and involves great water forces. The constructive and destructive effects of these forces must be understood in relation to potential settlement, transportation, and water power. Too, the glacial mechanics related to the cyclic appearance of these lakes need analysis.

Several large Alaskan ice-dammed lakes are in existence. Generally they are on the interior side of the coastal mountains from central southern to central southeastern Alaska. Usually such a lake is near the terminus of a blunt-edged glacier, most often having white ice between the lake and the glacier's end.

Lake George, about 60 miles east of Anchorage, is one of the world's larger ice-dammed lakes. It is fed by melt water and is dammed by Knik Glacier. For at least the past 35 years the lake has been emptying annually, starting approximately the first week in August. In ten days the lake level drops about 120 feet; the size changes from an L-shaped 14 by 4 miles to three small, shallow lakes. Drainage is through a 5-mile-long gorge, about 100 feet wide and 200 feet deep, between the Knik Glacier and a mountain ridge. The gorge is closed by mid-winter. Further analysis of this cycle and the lake's significance is desirable.

KIRK H. STONE—*World Air Photo Coverage for Geographic Research.*

Only recent research in American geography has shown the values gained by the use of air photos. This newness is partly a result of the recency of existence of the photos themselves. However, a primary reason has been that geographers have not known what parts of the world have been photographed from the air.

A map of world air photo coverage has been prepared. It shows known and probable areas of photography, excluding the U.S.S.R. The map was prepared from source material generally available to the public. About 22 million square miles are indicated as photographed. This coverage amounts to 45 per cent of the earth's land surface and is so located as to include possibly 80 per cent of the world's more densely populated areas.

The photography varies considerably in type, physical characteristics, cost, and accessibility. However, in general, air photos are available to American geographers doing both foreign and domestic research. Increased use of vertical and oblique air photos with the other geographic research techniques is most likely to lead to rapid improvement of American geographical research.

ARTHUR N. STRAHLER—*Empirical or Explanatory Method in Physical Geography; Which is Better?*

The empirical-quantitative method of physical geography treats terrain, climate, soils, and other factors of the physical environment in terms of symbols, numbers, or ratios; the explanatory-descriptive method treats these factors in qualitative expressions that include explanations of the phenomena. It is the opinion of the author that both methods are valuable to the professional geographer, but that each method has its special uses and advantages.

The explanatory-descriptive method is recommended for use in introductory physical geography teaching where cultural aims of a general education are paramount. Beyond this the method is valuable to the advanced student and professional geographer in increasing his ability to predict expectable phenomena from limited data and in enabling him to select sample data wisely for quantitative studies. The empirical-quantitative method should be used principally by the specialist investi-

gating research problems and is the only way in which the information can be handled for statistical and mathematical analysis. For these reasons it is suggested that the modern geographer might well give more attention to cultivating both methods, rather than selecting one and rejecting the other.

BENJAMIN A. TATOR—*Pediment Terminology.*

The term "pediment" is the most suitable designation for the relatively broad degradational surface common to the dry region. Long usage has gained universal acceptance for it and there is no hint of genesis in its construction. Qualification as to physiographic position may be expressed by employment of "mountain," "piedmont," or "flat-land," the three geomorphic habitats of the landform. Additional useful appellatives should include "subaerial," for the non-alluviated, and "suballuvial," for the alluviated forms. Further analysis may reveal that a pediment is "alluviated to depth of scour," "excessively alluviated," or "stripped" of its alluvial cover.

The distinction between "stream bench," "stream terrace," and "pediment" is troublesome due to the gradations in process and forms which exist between them. "Stream bench" should be restricted in usage to the erosion level confined by recognizable valley walls; "stream terrace" should apply only to valley-contained surfaces of aggradation. "Partial pediment" may be employed for stream bench development of widespread extent, but of lesser magnitude than the complete local truncation and valley widening which produces the pediment. Mergence of pediment levels over a broad area has been aptly termed "pediment coalescence." There is no meaningful word in the present terminology which may be used to designate the regional landform produced by pedimentation.

BENJAMIN E. THOMAS—*The New Sahara: Recent Motor Expeditions.*

The Sahara, like many other remote regions, has been opened to motor traffic in recent years. Trails are constantly being improved so that only a few areas, such as those of mountains, sand dunes, or soft gravel, are surface obstacles to the automobile. In the northern Sahara, the rise of tourist travel has been accompanied by the establishment of hotels, service stations, and souvenir shops in the larger oases. Bus lines connect important settlements and are patronized by the local population. Away from the tourist routes, however, the Sahara is unchanged. Camels are used by nomads and Arab traders. Donkeys serve local needs in the oases.

Recent French motor expeditions (1951–1953) call attention to the present status of routes and to improvements for the future. The spectacular 1951 automobile race from Algiers to Cape Town had 35 participants and the 1953 repetition of the event has 50 entries. Only a few gaps of difficult trails remain on the route, and these are being improved. Other expeditions include a private tour from Dakar to Brazzaville and return, an automobile race over a circuit in Morocco that includes part of the Sahara, and a long military motor mission through the Sahara and West Africa.

Two remaining difficulties of motoring in the Sahara are the terrific heat of the

summer, and the large quantities of water, motor fuel, food, and spare parts that the motorist must carry in the barren areas where nothing is available locally.

JOHN H. THOMPSON—*Toward a Quantitative Measurement of Manufacturing.*

This paper presents a new quantitative, multiple-criteria method by which two aspects of manufacturing, magnitude and intensity, may be measured.

Statistical data for value added, salaries and wages, total employment in manufacturing, total employment in all industry groups, and population are needed for any area if it is to be rated by this method. Indexes are used so that various combinations of unlike phenomena may be added and quantitatively compared. These indexes are based upon the average of magnitude and intensity conditions in 1939 for fifty selected Standard Metropolitan Areas.

Separate ratings are calculated for three criteria of magnitude: 1) total employment in manufacturing, 2) value added, and 3) salaries and wages. These ratings are averaged to produce multiple-criteria, or summary magnitude ratings. The summary ratings are then generalized into nine magnitude classes and given letter designations from A to I.

Separate ratings are also calculated for three criteria of intensity: 1) ratio of total employment in manufacturing to total employment in all industry groups, 2) ratio of total employment in manufacturing to population, and 3) ratio of value added to population. Multiple-criteria, or summary intensity, ratings are derived by averaging the ratings of the individual criteria. These summary ratings are generalized into nine intensity classes and given Roman numeral designations from I to IX.

This method, applied to the Detroit, Cleveland, and Columbus Standard Metropolitan Areas, produces the following results:

	<i>Magnitude</i>					
	<i>Detroit</i>		<i>Cleveland</i>		<i>Columbus</i>	
	1939	1947	1939	1947	1939	1947
Empl. in Mfg.	533	794	216	384	42	78
Value Added	544	800	253	425	45	76
Salaries & wages	885	979	341	459	40	81
Multiple-criteria or summary rating	580	858	236	423	42	79
Magnitude Class	B	A	C	B	F	E

	<i>Intensity</i>					
	<i>Detroit</i>		<i>Cleveland</i>		<i>Columbus</i>	
	1939	1947	1939	1947	1939	1947
Empl. in Mfg.	140	170	107	158	70	101
Empl. in all grps.						
Empl. in Mfg.	145	182	110	179	70	108
Population						
Value Added	147	183	128	197	75	105
Population						
Multiple-criteria or summary rating	144	179	115	178	72	105
Intensity Class	III	II	IV	II	VI	IV

GLENN T. TREWARTHA AND WILBUR ZELINSKY—*Report on Current Research in the Population Geography of Tropical Africa.*

The authors of this paper are currently engaged, with the assistance of a group of graduate students, in research on the population geography of tropical Africa. The present report is intended to indicate the variable techniques evolved in performing this work and to suggest what has been accomplished in mapping the spatial distributions of the inhabitants of the region. The explanation of these patterns—the final and most difficult phase of the project—has been in sufficiently probed to warrant inclusion at this stage.

The choice of tropical Africa as a region for study was prompted only in part by the need for knowledge of this large and significant portion of the inhabited earth. Equally important was the urge to set up an experiment in population geography requiring the development of methods of study for dealing with population in those extensive tracts of the world where statistical data are meager, unreliable, and of recent date. In addition to the immediate goal of producing adequate population maps and explanatory text for tropical Africa, there is the hope that this project may provide materials for the initial chapter of a much-needed population atlas of the world.

Only within the past few years have population censuses and estimates been published for most of the countries of tropical Africa. These statistics vary widely in enumeration methods and in degree of completeness and accuracy; but even the best sets of figures fall well short of Western European and North American standards. The unreliability of even national population totals and the short time span of statistical coverage make any study of population trends hazardous. The combination of sub-literate cultures and inadequate administrative machinery means at best only fragmentary data on age, sex, marital status, employment, residence, and religion; information on births, deaths, and migration among native peoples is even more meager. As grave a handicap as any is the lack of usable base maps for most of the area involved. In spite of these difficulties, a promising literature on African demography has begun to appear and a scattering of valuable population maps have been drawn by European geographers.

A manuscript map has been prepared showing density of population for the bulk of tropical Africa by the smallest administrative division for which figures and boundary information could be obtained. More refined dot and dasymetric maps are in process of preparation. A complex distributional pattern emerges with only a few well-defined peaks and hollows. The indifferent correlation with such physical factors as climate, soil, physiography, vegetation, and mineral resources suggests the vital importance of historical and cultural factors.

Relatively large-scale population maps have also been compiled for Uganda, Kenya, Nyasaland, French Guinea, and the Gold Coast—the first three using the dot method, the next the dasymetric technique, and the last choropleths based on minor civil divisions. On all except the last map, the data were treated by indirect means: the plotting of villages (of assumed average population) from large-scale topographic sheets; the location on large-scale maps of place-names given in census

reports and the placement of symbols thereabouts with the aid of geographic intuition; or the location of tribal concentrations by means of place names.

STEPHEN S. VISHNER—*Comparative Agricultural Potentials of the World's Regions.*

The eighty regions into which the lands of the world have been divided by some geographers are here rated as to their agricultural potential on the basis of seven criteria: average topographical suitability, average soil quality, warmth sufficiency, amount of rainfall, rainfall time distribution, weather dependability, and, finally the average accessibility of markets.

Each region is rated as poor, fair, good, or excellent as to each of these criteria, to which ratings a numerical value of 0 to 4 is assigned. On the basis of the sums of their scores, the eighty regions are grouped into 10, from the poorest one-tenth to the best. Most of the best one-tenth of the world, agriculturally, is in America's Midwest and in western Europe. A table shows the scores of each of the 80 regions on the basis here used, and a map shows the location of the quality tenths.

T. R. WEIR—*The Winter Feeding Period in the Southern Interior Plateau of British Columbia.*

The winter feeding period within the southern Interior Plateau of British Columbia varies from zero in the deep valley bottoms and lower terraces to six months along the high eastern margin flanked by the Cariboo and Monashee Ranges. On the uplands the minimum feeding period is seldom less than three months. Dependence on wild hay, chiefly sedges and horsetail, is common although ranchers are coming to appreciate the superiority of cultivated hays, especially timothy and alfalfa. In the lowlands below 3,000 feet where the open range affords conditions favorable to early spring and the late fall grazing, the feeding period does not exceed three months and is frequently less. Here dependence on cultivated hays is nearly complete. Only those ranches which have been fortunate enough to acquire land along the lower terraces and bottoms of major valleys can rustle some of their cattle all winter. In keeping with good range practices, dependence on winter range is giving way to supplementary feeding for part of the winter.

ROBERT C. WEST—*The Term "Bayou" in the United States: A Study in the Geography of Place Names.*

For the geographer and historian one of the more significant aspects of place name study involves the origin, spread, and present distribution of the generic parts of toponyms. Generic terms dealing with physical features, such as brook, run, butte, and arroyo, are usually the more meaningful parts of geographic names, for they are durable language forms, originally associated with definite cultures. The geographic treatment of such terms as found in place names might serve as an aid to the study of imprints left on the cultural landscape by movements of ethnic groups.

A geographic study of the term "bayou" as used in place names in the United States reveals the influence of Louisiana French culture in the lower Mississippi and adjacent areas during the 18th and early 19th centuries. The present distribution of "bayou" is surprisingly widespread. From a focus in Louisiana, it encompasses

most of the Gulf Coast, extends northward beyond Cairo, and is found occasionally along the lower Ohio and Wabash rivers. Westward and northwestward from Louisiana "bayou" place names continue into east central Texas and up the Red, Ouachita, Arkansas, and White Rivers into Arkansas and Oklahoma. Although in its original sense "bayou" refers to sluggish streams or distributaries, it is now applied to a variety of water features, and extends outside the area of flood plain and coastal alluvium.

"Bayou" probably derives from the Mobilian Choctaw *bayuk*, and was adopted by Frenchmen who settled in southern Louisiana and the Gulf Coast to the east in the early 18th century. The term became firmly established in place names in areas of permanent French settlement in the lower Mississippi area, but was spread northward and westward from that focus by French hunters and traders. During the 18th century in Louisiana, French were active in the Canadian trade, which followed the Mississippi and Wabash rivers; traders from New Orleans probably spread the term into east Texas along the San Antonio-Natchitoches trail and possibly along the Texas coast; Louisiana hunters, ascending the western tributaries of the lower Mississippi to the prairies of Arkansas and Oklahoma, carried the term "bayou" with them.

Probably introduced by recent migrants from Arkansas, or earlier by Civil War veterans of lower Mississippi campaigns, "bayou" is now used as a folk-term in some areas of eastern Kansas, eastern Nebraska, and north central Illinois. The area of its usage in place names, however, appears to be contracting, especially in the North and West, where people of Anglo-Saxon origin are replacing the Louisiana French word with their own terms, such as slough, creek, lake, and pond.

DERWENT WHITTLESEY—*Kenya—The Land and the Mau Mau.*

Europeans have introduced to Africa south of the Sahara new things and thoughts which have profoundly altered African life. Africans are beginning to agitate for a larger share in control and operation of the continent. The Mau Mau outbreaks of 1952 exemplify the extreme form of this ambition.

The paper sketches the regional structure of what is now Kenya as it was before the Partition of Africa, takes up the regional alterations resulting from European participation in African affairs, both intentional and unplanned, and sets forth the current stresses and pressures, with particular reference to the character and use of the land.

JOSEPH E. WILLIAM—*The Relief Map.*

American cartography, where it deals with relief, should be studied in comparison with the excellent work which has been done in Europe for the past thirty years. The relief map as a display problem in psychology should be carefully studied so that the proper colors, shading, and rock drawing may be used to convey the actual terrain to the uninitiated. Perhaps optics could also contribute something toward preparing a better interpretation of the relief. Most of all, we need to study the entire field of the preparation of the relief map manuscript and its final reproduction.

The day of the generalized hypsometric map is ending and it is time that we make a serious effort to adapt our cartographic techniques to the merged-color-illuminated type of relief map.

WILLIAM C. WONDERS—*Company Towns and Parasite Communities in Western Newfoundland.*

Construction of the railway across Newfoundland fifty years ago opened the interior and western parts of the island to development and settlement. This was effected mainly by large companies exploiting the forest and mineral resources. Recently the U.S.A.F. has played a similar though smaller role in its base construction. New settlements were created and previously existing ones greatly affected. There grew up "company towns," usually with "parasite communities" nearby. Despite great contrasts between the two types of communities, they have become increasingly interdependent with the passage of time. Eventually as the companies withdraw from town administration, an amalgamated community will develop. Necessity will force municipal responsibility up the local inhabitants, an innovation in Newfoundland outside St. Johns, but one already shouldered by some of the communities concerned.

JOHN K. WRIGHT—*The Open Polar Sea.*

From the sixteenth century until about the year 1880 many explorers and geographers were firmly convinced that there is an open, ice-less sea around the North Pole and that, once reached, it might offer a navigable route between the Atlantic and the Pacific. This belief had important bearings on the course of Arctic exploration and was discussed both pro and con from widely different points of view. In this paper, after a brief "biographical sketch" of the theory, some of the arguments regarding it are illustrated. An attempt is also made to draw general conclusions concerning the motives of these arguments and the qualities of thought that they reveal. The paper is thus a case study in the history of geographical error.

ROBERT LEE WYENER—*Geographic Factors and Cartographic Problems in Long Range and Regional Mapping Programs.*

Geographic and cartographic problems are inherent in long range and regional mapping programs. Scope, availability of data, expediency, and current events are the factors that contribute to extenuating circumstances which hinder expedition of such programs. These variable factors pose questions as to the ability of cartographers and geographers to fulfill their current commitments in light of these deterrents.

In the Americas and many parts of the world there are still large areas unsurveyed or unmapped at medium or large scales. Old soil surveys, land use maps, cadastral plans, and very small scale maps are the only available data for cartographic representation of the areas. It is the purpose of long range programs to supply the lacking map coverage by compiling maps at medium and large scales.

The rapidity of map obsolescence and the consequent continual need for revision

further delay in the mapping programs. Due to exigencies and world conflicts expediency is most vital and may spur some programs at the expense of others. The burden of these vast mapping programs is alleviated by the sharing of map production by cartographic organizations with the assistance of modern aerial surveying and mapping techniques. Present plans envisage possible attainment of some goals requiring 50 to 100 years for their completion.

Nevertheless, long range and regional mapping programs are in reality infinite in scope. Geographic factors in the forms of nationalism, wars, irredentism, floods, quakes; social, industrial and economic progress expressed in terms of dams and irrigation; oilwells, refineries, and pipeline developments; mills, roads, and railroad construction; demography and urbanization—speed map obsolescence and negate their current accuracy of publication date. Social, economic, and political processes cause, affect, and change world geography keeping cartographers busy and geographers in a turmoil.

B. ZABORSKI—*Changes in the Geographical Distribution of People in Northern Eurasia During the Christian Era.*

The Russians spread to the White Sea and the Volga basin mostly at the cost of the Finnic peoples. They penetrated in Siberia (from 17th century) mostly along the black soil belt and open landscapes.

There were many ethnic changes in Siberia resulting from the assimilation of one group of native population by another. For example, the Chukchi assimilated largely the Yukaghirs and the Yakuts assimilated a part of the Tunguz.

